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Office of Conservation and Renewable Energy

10 CFR Part 430

Energy Conservation Program for Consumer Products; Proposed Rule and Notice

DEPARTMENT OF ENERGY

Office of Conservation and Renewable Energy

10 CFR Part 430

[Docket No. CE-RM-87-102]

Energy Conservation Program for Consumer Products; Proposed Rulemaking and Public Hearing Regarding Energy Conservation Standards for 3 Types of Consumer Products

AGENCY: Office of Conservation and Renewable Energy, DOE.

ACTION: Notice of proposed rule and public hearing.

SUMMARY: The Energy Policy and Conservation Act (EPCA), as amended by the National Energy Conservation Policy Act (NECPA) and the National Appliance Energy Conservation Act (NAECA), prescribes energy conservation standards for certain major household appliances, and requires the Department of Energy (DOE) to administer an energy conservation program for these products. NAECA requires DOE to consider amending the energy conservation standards for refrigerators, refrigerator-freezers, and freezers; to establish standards for small gas furnaces; and to consider establishing energy conservation standards for television sets.

The Department is not proposing a specific level within the range considered, rather, DOE is soliciting comments and information from the public to be considered in promulgating the final rule. The final rule will specify a specific level for refrigerators, refrigerator-freezers and freezers; the level selected could include no change to the standard level prescribed by NAECA.

For small gas furnaces, the Department is proposing to determine that standards would result in a significant conservation of energy and be economically justified.

Finally, for television sets, the Department is proposing to determine that an energy conservation standard would result in a significant conservation of energy but would not be economically justified.

DATES: Written comments on the proposed rule must be received by the Department by January 31, 1989.

Oral views, data, and arguments may be presented at the public hearing to be held in Washington, DC, on January 12, 1989. Requests to speak at the hearing must be received by the Department no later than 4:00 p.m., January 10, 1989.

The hearing will begin at 9:30 a.m., on January 12, 1989, and will be held at the U.S. Department of Energy, Forrestal Building, Room 1E-245, 1000 Independence Avenue, SW., Washington, DC.

ADDRESSES: Written comments, oral statements, requests to speak at the hearing and request for speaker lists are to be submitted to U.S. Department of Energy, Office of Conservation and Renewable Energy, Hearings and Dockets, Energy Conservation Program for Consumer Products, Docket No. CAS-RM-87-102, Room 6B-025, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586-9320.

Copies of the transcript of the public hearing and written public comments received may be read at the DOE Freedom of Information Reading Room, U.S. Department of Energy, Forrestal Building, Room 1E-190, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586-6020, between the hours of 9:00 a.m. and 4:00 p.m., Monday through Friday, except Federal holidays.

For more information concerning public participation in this rulemaking proceeding, see section V, "Public Comment Procedures," of this notice.

FOR FURTHER INFORMATION CONTACT:

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U.S. Department of Energy, CE-43.1, Docket No. CAS-RM-87-102, Forrestal Building, Room 6B-025, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586-9320.

SUPPLEMENTARY INFORMATION:

I. Introduction

a. Authority

b. Background

II. General Discussion

a. Test Procedures

b. Technological Feasibility

1. General
2. Maximum Technologically Feasible Levels

c. Energy Savings

1. Determination of Savings
2. Significance of Savings

d. Rebuttable Presumption

e. Economic Justification

1. Economic Impact on Manufacturers and Consumers
2. Life-Cycle Costs
3. Energy Savings
4. Lessening of Utility or Performance of Products
5. Impact of Lessening of Competition
6. Need of The Nation to Conserve Energy
7. Other Factors

III. Product-Specific Discussion

a. Refrigerators, Refrigerator-Freezers/ Freezers

1. Classes
2. Design Options
3. Comments on the Advance Notice of Proposed Rulemaking
4. Efficiency Levels Analyzed

b. Small Gas Furnaces

1. Classes
2. Design Options
3. Comments on the Advance Notice of Proposed Rulemaking
4. Efficiency Levels Analyzed

c. Television Sets

1. Classes
2. Design Options
3. Comments on the Advance Notice of Proposed Rulemaking
4. Efficiency Levels Analyzed

IV. Environmental, Regulatory Impact, Takings Assessment, Federalism, and Regulatory Flexibility Reviews

a. Environmental Review

b. Regulatory Impact Review

c. "Takings" Assessment Review

d. Federalism Review

e. Regulatory Flexibility Review

V. Public Comment Procedures

a. Participation in Rulemaking

b. Written Comment Procedures

c. Public Hearing

d. Issues Requested for Comment

I. Introduction

a. Authority

Part B of Title III of the Energy Policy and Conservation Act (EPCA), Pub. L. 94-163, as amended by the National Energy Conservation Policy Act (NECPA), Pub. L. 95-619, by the National Appliance Energy Conservation Act (NAECA), Pub. L. 100-12, and by the National Appliance Energy Conservation Amendments of 1988 (NAECA 1988), Pub. L. 100-357,[1] created

[1] Part B of Title III of EPCA, as amended by NECPA, NAECA, and NAECA 1988, is referred to in this notice as the "Act." Part B of Title III is codified at 42 U.S.C. 6291 *et seq.* Part B of Title III of EPCA, as amended by NECPA only, is referred to in this notice as NECPA.

the Energy Conservation Program for Consumer Products other than Automobiles. The consumer products subject to this program (often referred to hereafter as "covered products") are: Refrigerators, refrigerator-freezers and freezers; dishwashers; clothes dryers; water heaters; central air conditioners and central air conditioning heat pumps; furnaces; direct heating equipment; television sets; kitchen ranges and ovens; clothes washers; room air conditioners; fluorescent lamp ballasts; and pool heaters; as well as any other consumer product classified by the Secretary of Energy. Section 322. To date, the Secretary has not so classified any additional products.

Under the Act, the program consists essentially of three parts: Testing, labeling, and mandatory energy conservation standards. The Department of Energy (DOE or Department), in consultation with the National Institute of Standards and Technology (NIST), is required to amend or establish new test procedures as appropriate for each of the covered products. Section 323. The purpose of the test procedures is to provide for test results that reflect the energy efficiency, energy use, or estimated annual operating costs of each of the covered products. Section 323(b)(3). A test procedure is not required if DOE determines by rule that one cannot be developed. Section 323(d)(1). One hundred and eighty days after a test procedure for a product is adopted, no manufacturer may represent the energy consumption of, or the cost of energy consumed by the product except as reflected in a test conducted according to the DOE procedure. Section 323(c)(2).

The Federal Trade Commission (FTC) is required by the Act to prescribe rules governing the labeling of covered products for which test procedures have been prescribed by DOE. Section 324(a). These rules are to require that each particular model of a covered product bear a label that indicates its annual operating cost and the range of estimated annual operating costs for other models of that product. Section 324(c)(1). Disclosure of estimated operating cost is not required under section 324 if the FTC determines that such disclosure is not likely to assist consumers in making purchasing decisions or is not economically feasible. In such a case, FTC must require a different useful measure of energy consumption. Section 324(c). At the present time there are FTC rules requiring labels for the following products: room air conditioners, furnaces, clothes washers, dishwashers, water heaters, freezers, refrigerators and refrigerator-freezers, and central air conditioners. 44 FR 66475, November 19, 1979, and 52 FR 46888, December 10, 1987.

For each of 12 of the covered products, the Act prescribes an initial Federal energy conservation standard. Section 325 (b) through (h). The Act establishes effective dates for the standards in 1988, 1990, 1992 or 1993, depending on the product, and specifies that the standards are to be reviewed by the Department within three to ten years, also depending on the product. Section 325 (b) through (h). After the specified three- to ten-year period, DOE may promulgate new standards for each product; however, the Secretary may not prescribe any amended standard which increases the maximum allowable energy use, or decreases the minimum required energy efficiency, of a covered product. Section 325(l)(1). The Department's first review of standards is for refrigerators, refrigerator-freezers and freezers. The Act requires DOE to publish a final rule for these products by July 1, 1989. Section 325(b)(3)(A)(i).

The Act also directs DOE to prescribe an energy conservation standard, no later than January 1, 1989, for small gas furnaces, i.e., gas furnaces having an input of less than 45,000 Btu per hour and manufactured on or after January 1, 1992. Section 325(f)(1)(B).

With regard to another covered product, television sets, the Act allows the Department to prescribe an applicable standard; however, such standard may not become effective before January 1, 1992. Section 325(i)(3).

These products (refrigerators, refrigerator-freezers, and freezers; small gas furnaces; and television sets) are the subject of this rulemaking.

Any new or amended standard is required to be designed so as to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. Section 325(1)(2)(A).

Section 325(1)(2)(B)(i) provides that before DOE determines whether a standard is economically justified, it must first solicit comments on a proposed standard. After reviewing comments on the proposal, DOE must then determine that the benefits of the standard exceed its burdens, based, to the greatest extent practicable, on a weighing of the following seven factors:

(1) The economic impact of the standard on the manufacturers and on the consumers of the products subject to such standard;

(2) The savings in operating costs throughout the estimated average life of the covered product in the type (or class) compared to any increase in the price of, or in the initial charges for, or maintenance expenses of, the covered products which are likely to result from the imposition of the standard;

(3) The total projected amount of energy savings likely to result directly from the imposition of the standard;

(4) Any lessening of the utility or the performance of the covered products likely to result from the imposition of the standard;

(5) The impact of any lessening of competition, determined in writing by the Attorney General, that is likely to result from the imposition of the standard;

(6) The need for national energy conservation; and

(7) Other factors the Secretary considers relevant. In addition, the Act specifies criteria for petitions to DOE in regard to amendments to standards. Section 325(k). Under the Act, any person may petition the Department to conduct a rulemaking to amend a Federal energy conservation standard for any covered product. Section 325(k)(1). The Department must grant such a petition if it determines that an amended standard will result in significant conservation of energy, is technologically feasible and is cost effective. Section 325(k)(2).

Sections 325(k)(3) (A) and (B) stipulate that in no case may an amended standard apply to products manufactured within three years or five years, depending on the product, after publication of the final rule establishing a standard.

Prior to proposing a new or amended standard, DOE is required to publish an advance notice of proposed rulemaking which specifies the type (or class) of covered product to which the rule may apply and which provides a 60-day period during which interested persons may submit written comments. Section 325(m)(1) (A) and (B).

Section 325(q) provides that manufacturers having annual gross revenues not exceeding $8 million may apply to DOE for an exemption from all or part of the requirements of an energy conservation standard. This exemption may not extend beyond two years from the effective date of any standards requirement. This authority will not be exercised by DOE unless, after written consultation with the Attorney General, the Secretary finds that failure to allow the exemption would likely result in a lessening of competition.

Section 326 of the Act requires manufacturers to submit information or reports to assure that each covered

product to which a standard applies meets the required energy efficiency level. The Act also specifies that in determining information requirements, DOE consider existing sources of information, including nationally recognized trade association certification programs. Section 326(d).

Enforcement-related provisions of the Act provide for: (1) DOE to prescribe rules requiring manufacturers to allow the Department to observe testing and inspect results of testing conducted by the manufacturer (section 326 (b)(5)); (2) manufacturers to supply to DOE a reasonable number of products for testing purposes (section 326(b)(3)); (3) manufacturers to submit information or reports necessary to ensure compliance (section 326(d)); and (4) injunctive relief against any prohibited act, including distribution of noncomplying products (section 334).

Section 327 of the Act addresses the effect of Federal rules concerning testing, labeling, and standards on State laws or regulations concerning such matters. Generally, all such State laws or regulations are superseded by the Act. Section 327 (a) through (c). Exceptions to this general rule include: (1) State standards prescribed or enacted before January 3, 1987, and applicable to appliances produced before January 3, 1988, may remain in effect until the applicable standard begins (section 327(b)(1); (2) State procurement standards which are more stringent than the applicable Federal standard (section 327(b)(2) and (e)) and certain building code requirements for new construction, if certain criteria are met, are exempt from Federal preemption (section 327(b)(3) and (f)(1) through f(4)); (3) State regulations banning constant burning pilot lights in pool heaters; and (4) State standards for television sets effective on or after January 1, 1992, may remain in effect in the absence of a Federal standard for such product (section 327(b)(6) and 327(c)).

Another exception to Federal preemption concerns standards for refrigerators, refrigerator-freezers and freezers. The Act specifies that if DOE does not publish a final rule before January 1, 1990, relating to the revision of Federal standards for this product category, the State of California's December 14, 1984, standards (effective January 1, 1992) for these products, would become effective in California beginning January 1, 1993, and may not be preempted by any Federal standard prescribed on or after January 1, 1990. Section 325(b)(3)(A)(ii)(I) and section 327(c).

In addition, if DOE does not publish a final rule before January 1, 1992, relating to the revision of standards for refrigerators, refrigerator-freezers and freezers, any State regulation which applies to such products manufactured on or after January 1, 1995, is exempt from Federal premption until the effective date of a Federal standard. Section 325(b)(A)(ii)(II).

A State whose energy conservation standard is preempted may petition the Department for a rule that it not be preempted on the basis that the State regulation is needed to meet unusual and compelling State or local energy interests. Section 327(d). However, DOE cannot issue the requested rule if it is established that such State regulation will significantly burden marketing, manufacturing, distribution, sale or servicing of the covered products, or is likely to result in the unavailability in the State of any covered product with performance characteristics that are substantially the same as those generally available in the State at the time of DOE's determination. Section 327(d)(4).

The Act further provides that, except under certain energy emergency conditions, any State regulation for which exemption is granted shall apply to products manufactured three years after DOE publishes such a rule in the **Federal Register**, or five years after publication, if DOE finds that additional time is necessary for retooling and redesign. Section 327(d)(5).

b. Background

NECPA required DOE to establish mandatory energy efficiency standards for each of 13 covered products.[2] These standards were to be designed to achieve the maximum improvement in energy efficiency that was technologically feasible and economically justified.

NECPA provided, however, that no standard for a product be established if there were no test procedure for the product, or if DOE determined by rule either that a standard would not result in significant conservation of energy, or that a standard was not technologically feasible or economically justified. In determining whether a standard was economically justified, the Department was directed to determine whether the benefits of the standard exceeded its burdens by weighing the seven factors discussed above.

NECPA specified the priorities and procedures to be followed in adopting efficiency standards. Nine of the 13 covered products were given priority. These nine products were: Refrigerators and refrigerator-freezers; freezers; clothes dryers; water heaters; room air conditioners; home heating equipment not including furnaces; kitchen ranges and ovens; central air conditioners; and furnaces.

The Department published an advance notice of proposed rulemaking for the nine priority products on January 2, 1979. 44 FR 20. On December 13, 1979, DOE published an advance notice of proposed rulemaking for dishwashers, television sets, clothes washers, and humidifiers and dehumidifiers. 44 FR 72276. An advance notice for central air conditioners (heat pumps) was published on January 23, 1980. 45 FR 5602.

After receiving comments on the January 2 advance notice, on June 30, 1980, DOE published its first proposed rulemaking for the nine products. 45 FR 43976. (Hereafter referred to as the June 1980 proposal.) This NOPR set forth DOE's proposal concerning energy efficiency standards for the covered products. It also proposed comprehensive requirements for certification and enforcement of the standards, procedures for processing petitions by States that sought exemption for regulations subject to the general preemption requirements of NECPA, and small business exemptions.

On April 2, 1982, DOE issued a further notice of proposed rulemaking with respect to the nine priority products. 47 FR 14424. (Hereafter referred to as the April 1982 proposal). With respect to eight of the products, DOE proposed to make a determination that a standard would not result in significant conservation of energy and would not be economically justified.[3] The April 1982 proposal also proposed rules governing petitions to DOE both by States to obtain exemption from preemption of State or local energy efficiency standards, as well as by manufacturers to obtain preemption of State or local standards.

On Decmber 22, 1982, DOE published a final rule in which the Department determined that efficiency standards

[2] The consumer products covered by NECPA included: Refrigerators and refrigerator-freezers; freezers; dishwashers; clothes dryers; water heaters; room air conditioners; home heating equipment not including furnaces; television sets; kitchen ranges and ovens; clothes washers; humidifiers and dehumidifiers; central air conditioners; and furnaces.

[3] The April 1982 proposal did not propose any rule with respect to the product type "home heating equipment, not including furnaces," or with respect to that class of the product water heaters made up of heat pump water heaters, or with respect to those classes of the product central air conditioners that are heat pumps.

were not warranted for clothes dryers and kitchen ranges and ovens. 47 FR 57198. (Hereafter referred to as the December 1982 final rule.) At that time, DOE also adopted final procedures by which States might obtain exemption for State or local efficiency standards from Federal preemption, and by which manufacturers might obtain preemption of a State or local standard not otherwise preempted.

On August 30, 1983, DOE published a final rule with respect to the remaining six covered products: Refrigerators and refrigerator-freezers, freezers, water heaters, furnaces, room air conditioners and central air conditioners. 48 FR 39376. (Hereafter referred to as the August 1983 final rule). For each of the six products covered by the August 1983 final rule, except central air conditioners, DOE determined that an energy efficiency standard would not result in significant conservation of energy and would not be economically justified. With respect to central air conditioners, DOE found that an energy efficiency standard would result in significant conservation of energy, but not be economically justified.

On April 1, 1985, DOE published a proposed rule with respect to four covered products: Dishwashers, television sets, clothes washers and humidifiers and dehumidifiers, 50 FR 12966. (Hereafter referred to as the April 1985 proposal). For each of the four products covered by the April 1985 proposal, DOE proposed that an energy efficiency standard would not be economically justified and would not result in a significant conservation of energy.

During 1983, DOE's December 1982 and August 1983 final rules were challenged in a lawsuit brought by the Natural Resources Defense Council (NRDC) and others against the Department. On July 16, 1985, the U.S. Court of Appeals set aside DOE's December 1982 and August 1983 final rules. *NRDC* v. *Herrington*, 768 F.2d 1355 (D.C. Cir. 1985).

Consequently, on March 5, 1986, DOE published notices in the **Federal Register** removing the December 1982 and August 1983 final rules and withdrawing the April 1985 proposal. 51 FR 7549 and 51 FR 7582.

The National Appliance Energy Conservation Act, which became law on March 17, 1987, amended EPCA in part by: Redefining "covered products" (specifically, refrigerators, refrigerator-freezers, and freezers were combined into one product type from two; humidifiers and dehumidifiers were deleted; and pool heaters were added); establishing Federal energy conservation standards for 11 of the 12 covered products; and creating a schedule, according to which each standard is to be reviewed to determine if an amended standard is required.

More recently, the National Appliance Energy Conservation Amendments of 1988 (Pub. L. 100–357) established Federal energy conservation standards for a new covered product, fluorescent lamp ballasts. These amendments also created a review schedule for DOE to determine if an amended standard is required.

As stated above, the Act requires DOE to publish a final rule for small gas furnaces by January 1, 1989; for refrigerators, refrigerator-freezers, and freezers by July 1, 1989; and to consider establishing a standard for television sets. DOE is combining these rulemaking items into one action. The purposes of this rulemaking is three-fold: (1) To review the energy conservation standards for refrigerators, refrigerator-freezers, and freezers (hereafter referred to as refrigerators) that have been established by the Act; (2) to propose energy efficiency standards between 71 percent and 78 percent AFUE (annual fuel utilization efficiency) [4] for small gas furnaces, i.e., those having an input rate less than 45,000 Btu per hour; and (3) to consider the establishment of an energy conservation standard for television sets.

As directed by the Act, DOE published an advance notice of proposed rulemaking, with a 60-day comment period that ended February 5, 1988, as the Department considers prescribing applicable new or amended standards for these three products. 52 FR 46367, December 7, 1987. (Hereafter referred to as the advance notice). The advance notice presented the product classes that DOE planned to analyze, and provided a detailed discussion of the analytical methodology and analytical models that the Department expected to use in performing the analysis to support this rulemaking. The Department invited comments and data on the accuracy and feasibility of the planned methodology and encouraged interested persons to recommend improvements or alternatives to DOE's approach. The comments in response to the advance notice are addressed in sections II and III of this notice. In addition, on January 28, 1988, a public hearing was held on the advance notice.

[4] The Annual Fuel Utilization Efficiency (AFUE) is the ratio annual fuel output energy to annual fuel input energy, expressed as a percent.

II. General Discussion

As stated above, NAECA requires DOE to determine if the legislated standards for refrigerators should be amended, to establish a standard for small gas furnaces, and to consider establishing a standard for television sets.

The Act prohibits DOE from promulgating a standard for a product if (1) there is no test procedure for the product, (2) a standard is not technologically feasible, (3) DOE determines that a standard would not be economically justified, or (4) if a standard would not result in a significant conservation of energy. To measure possible energy savings and economic justification, DOE analyzed several possible standard levels for each product type (refrigerators and television sets) or class of product (small gas furnaces). Furthermore, the Act stipulates that any adjustment of a standard may only be toward stringent levels. With respect to each appliance, DOE analyzed various specific design options, including prototypes. A prototype can be either an individual component, e.g., high efficiency compressor, or a complete assembly with the design option installed, e.g., a condensing furnace. While a prototype design may be technologically feasible as an individual component or as part of a bread-board [5] assembly, it does not necessarily follow that techniques have been developed for mass production of the prototype design.

a. Test Procedures

For each product discussed in today's proposed rulemaking there is an applicable DOE test procedure to evaluate its energy efficiency. These test procedures also cover the various classes of products identified in today's notice. However, DOE has issued four test procedure waivers for refrigerator-freezers, all concerning variable defrost controls.[6] The engineering analysis for refrigerator-freezers for today's proposal is based upon the test procedures included in DOE's Decision and Orders concerning variable defrost controls. Research in support of the development of test procedures for refrigerator-freezers equipped with variable defrost controls has been completed. DOE issued a proposed rule concerning

[5] A bread-board unit is an experimental arrangement of the design made to test its feasibility.

[6] RF–001 Whirlpool Corp., 50 FR 34186, August 23, 1985; RF–002 White Consolidated Inc., 51 FR 15679, April 25, 1986; RF–003 and RF–004 Whirlpool Corp., 51 FR 36591, October 14, 1986.

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variable defrost controls on September 26, 1988. (53 FR 37416).

b. Technological Feasibility

1. General

For those products and classes of products discussed in today's notice, DOE believes that the efficiency levels analyzed, while not necessarily in production, are technologically possible. The technological feasibility of the design options is addressed in the product specific discussion. DOE's criteria for evaluating design options for technological feasibility are that the design options are already in use by the respective industry or that research has progressed to the likely development of a prototype.

Several comments addressed the subject of technological feasibility. The California Energy Commission (CEC) recommended that DOE put no limits on design options for technological feasibility, that DOE include prototypes, foreign market designs and designs with long paybacks. (CEC, No. 35, at 4.) [7] The Association of Home Appliance Manufacturers (AHAM) identified the need for DOE to establish maximum technologically feasible levels separately from any economic inputs. (AHAM, No. 22, at 4.) The Natural Resources Defense Council (NRDC) recommended that DOE increase standard levels to the maximum technologically feasible designs, such as evacuated panel insulation for refrigerators. (NRDC, No. 19, at 9.)

2. Maximum Technologically Feasible Levels

The Act requires that in considering any new or amended standards, the Department must consider those that "shall be designed to achieve the maximum improvement in energy efficiency which the Secretary determines is technologically feasible and economically justified." (Section 325(l)(2)(A).) Accordingly, for each class of product under consideration in this rulemaking, a maximum technologically feasible design option was identified. This is the most efficient model of a class for which at least a prototype exists. A complete discussion of each maximum technologically feasible level and design options included in each is found in the Engineering Analysis. *See* Technical Support Document, Chapter 3, specifically sections 3.2.3 through 3.2.5, 3.3, and 3.4.1 through 3.4.3. These are presented in Table 2–1, below.

TABLE 2–1.—MAXIMUM TECHNOLOGICALLY FEASIBLE LEVELS

Products and product classes	Unit energy consumption
Refrigerators and Refrigerator-Freezers:	
Manual Defrost (16.8 cu. ft.)	380 kWh/yr.
Partial Automatic Defrost (18.1 cu. ft.).	435 kWh/yr.
Automatic Defrost Top Mount (20.8 cu. ft.).	515 kWh/yr.
Automatic Defrost Side-by-Side (24.1 cu. ft.).	599 kWh/yr.
Automatic Defrost Side-by-Side with Through-the-Door Service Features (31.9 cu. ft.).	776 kWh/yr.
Automatic Defrost Top Mount with Through-the-Door Service Features (20.8 cu. ft.).	525 kWh/yr.
Automatic Defrost Bottom Mount (20.4 cu. ft.).	535 kWh/yr.
Freezers:	
Chest, Manual Defrost (22.5 cu. ft.).	315 kWh/yr.
Upright, Manual Defrost (26.1 cu. ft.).	343 kWh/yr.
Upright, Automatic Defrost (29.9 cu. ft.).	505 kWh/yr.
Small Gas Furnaces:	
Non-Weatherized (Indoor)	[1] 97% AFUE.
Weatherized (Outdoor)	[1] 97% AFUE.
Television Sets:	
Monochrome (13")	46 kWh/yr.
Color (19"–20")	171 kWh/yr.

[1] 78 percent AFUE is the maximum standard level that is allowed by the Act for small gas furnaces.

The Department believes that these are the maximum technologically feasible energy conservation levels from an engineering standpoint; some or all of these levels will be evaluated in accordance with the economic justification factors specified in the Act to determine if the levels are economically justified. Specifically excluded from further analysis are the maximum technologically feasible levels for small gas furnaces, since these levels are beyond the range in which the Department must establish standards.

The New York State Energy Office (NYSEO) called for DOE to explain why it does not adopt any design option that conserves more energy than the maximum technologically feasible design. The NYSEO also stated that for those design options selected, DOE must ensure that development and commercial availability correspond to the dates standards become effective. (NYSEO, No. 32, at 4–6). Admiral Home Appliances (Admiral) stated that "innovation cannot be legislated," therefore, maximum technologically feasible design options are those that are fully developed and commercially available today. Admiral also stressed NAECA's requirement that DOE delete design options that would lessen utility to the consumer and affect performance, life, and reliability of the covered appliance. (Admiral, No. 31, at 3).

DOE proposes that the maximum technologically feasible level is one that can be carried out by the addition of design options, both commercially feasible and prototypes, to the baseline units without affecting the product's utility. DOE believes that there are no products available with the same utility and capacity that are more efficient than the maximum technological level. DOE believes that design options, including prototypes and foreign designs, must be capable of implementation by the effective date of a standard.

Each maximum technologically feasible level was evaluated to determine if it would be commercially viable, that is, economically justified, at the time of the effective date of the standard. Design options that have unacceptable impacts on consumers or manufacturers or result in the changing of the utility of the product were rejected.

DOE provided lists of design options for engineering analysis in the advance notice. DOE received a number of comments on these design options, which resulted in more detailed design options for DOE review. DOE has considered these suggestions and has addressed them in the product specific discussions in this notice.

The analysis process is described fully in the Technical Support Document. Computer models and manufacturers' data were used to predict improvements in product efficiencies and the costs associated with these improvements.

The Engineering Analysis addresses two statutory requirements. The first requirement is the Department's evaluation of the maximum improvements in energy efficiency that are technologically feasible. The second requirement relates to the lessening of utility to the consumer of any of the covered products due to the imposition of standards. The Engineering Analysis also provides information on efficiencies and manufacturing costs to other sections of the overall analysis. The product specific sections of this notice include the method of analysis for each of the products.

c. Energy Savings

1. Determination of Savings

The Department forecast energy consumption through the use of the Lawrence Berkeley Laboratory

[7] Comments on the advance notice have been assigned docket numbers and have been numbered consecutively. Statements that were presented at the January 28, 1988, public hearing are identified as Testimony.

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Residential Energy Model (LBL-REM). The LBL-REM forecasts energy consumption over the period of analysis for candidate standards and the base case.[8] The Department quantified the energy savings that would be attributable to a standard as the difference in energy consumption between the standards case and the base case.

The LBL-REM, which is an improvement of the Oak Ridge National Laboratory Residential Energy End Use Model (ORNL Model) that was used by DOE in previous standards rulemakings is fully explained in the Technical Support Document. Appendix B to that document addresses the LBL-REM in detail. The LBL-REM contains algorithms to project average efficiencies, usage behavior, and market shares for each product. The model's assumptions and methods are described in the Technical Support Document. The market share algorithm used for the refrigerator analysis is the same as the one used in previous analyses. Since such products have no significant competition from technologies that use fuels other than electricity, the principal market share decisions are: purchase this product or not; and select among the available classes. The fraction of potential purchasers who actually purchase the product is determined each year by applying market share elasticities to the percent change in equipment price, operating expense (which includes changes in electricity price and in unit energy consumption), and income. The market share elasticities are constant over the projection period. The market share obtained by each class in any future year is assumed to be a constant fraction of total refrigerator sales. (*See* Technical Support Document, Table B.3). For refrigerators, the market shares range from a low of 0.7 percent for a top-mount refrgerator-freezer with through-the-door ice, to a high of 72.9 percent for a top-mount refrigerator-freezer without through-the-door ice service. If this assumption were changed, the results of the LBL–REM would be affected, e.g., for refrigerators, if the market share of less expensive and less energy consumptive products were to increase, the energy savings would be increased and the net present value would also likely be increased. If this scenario were to occur, consumers would sacrifice utility by purchasing refrigerators with fewer amenities. DOE requests comments on this issue.

On the other hand, a new market share algorithm for small gas furnaces had to be developed, since such products had not previously been analyzed separately. Market shares for small gas furnaces are determined using modifications to the algorithms developed for all heating and cooling end uses. *See* Technical Support Document section 4.2.3. Elasticities for heating equipment in new mobile homes, new large multifamily housing (five or more units), and all types of existing housing are calculated using methods and models developed by Lin, Hirst, and Cohn, *Fuel Choices in the Household sector*, Oak Ridge, TN: Oak Ridge National Laboratory, ORNL/CON–3, 1976. Those authors reported a cross-sectional analysis of residential fuel choices (equipment ownership market shares) for five major end uses, including space heating, air conditioning, water heating, food freezing, and cooking, using 1970 data from states.

For new single-family and new small (two to four units) multifamily housing, effective market share elasticities are derived from an econometric model originally developed by Electric Power Research Institute (EPRI), *Household Appliance Choice: Revision of REEPS Behavioral Models*, Palo Alto, CA: Electric Power Research Institute, EPRT EA–3409, Research Project 1918–1, 1984, and modified at Lawrence Berkeley Laboratory (LBL).

The model was established from a national data base disaggregated to the household level, using exogenous variables of equipment prices, operating expenses (which are proportional to fuel prices), household income, and other variables. The most significant difference between the EPRI model and the LBL model is the LBL model's characterization of a household discount rate for the choice of heating and cooling equipment as varying with maximum winter heat load and a measure of the oppressiveness of summer climate. Essentially, the data strongly support the hypothesis that households that are likely to use a particular piece of equipment frequently (because of a cold winter climate or a hot, humid summer climate) are likely to pay greater attention to future operating expenses. Such households are estimated as having lower discount rates, i.e., accepting longer payback periods for additional equipment expenses for heating or cooling appliances than those living in relatively mild conditions. Conversely, those households in milder climates give relatively greater weight to equipment price than to operating expense. *See* Technical Support Document, Appendix B. section B.5.

The LBL–REM is used to project residential energy use over the relevant time periods for: (1) Television sets with and without standards; (2) small furnaces at 71, 74, and 78 percent AFUE; and (3) refrigerators at different standard levels, including the NAECA-imposed 1990 standards, and several candidate amendment levels. By comparing the energy consumption projection at alternative standard levels or no standard (for television sets), at standards of 71 percent and 78 percent AFUE (for small furnaces), and at alternative standard levels or NAECA 1990 standards (for refrigerators), the Department estimated the amount of energy projected to be saved during the period 1992–2015.[9] The energy saved is expressed in Quads, i.e., quadrillion Btu. With respect to electricity, the savings are quads of source or primary energy, which is the energy necessary to generate and transmit electricity. The Act defines "energy use" as the quantity of energy directly consumed by a consumer product at point of use. This is generally called "site" energy, as opposed to "source" energy. There are great differences between these types of energy. In 1986, the amount of electrical energy consumed at the site was less than one-third of the amount of source energy that was required to generate and transmit the site electrical energy.[10] Therefore, it is important to identify whether the electricity involved is site or source energy.

The LBL–REM projections are dependent on many assumptions. Among the most important are responsiveness of household appliance purchases to changes in energy prices and consumer income, future energy prices, future levels of housing construction, and options that exist for improving the energy efficiency of appliances. As is the case with any complicated computer model simulation,

[8] For refrigerators the base case represents the NAECA 1990 standards; for small gas furnaces and television sets, the base case represents no-standards.

[9] LBL–REM was programmed to analyze a single standard level or alternative levels, over the entire period. That is, the fact that a standard might be revised during subsequent rulemakings was not considered by the model. The Department believes that it is not possible to predict what result such reviews may have, and therefore it would be speculative to model any particular result. Therefore, for purposes of this rulemaking, each standard level that was analyzed was projected to have been in place from the time of implementation to the year 2015.

[10] Energy Information Administration, *Electric Power Annual 1986*, Tables 7 and 41, DOE/EIA–0348(86), 1987.

the validity of the outputs is critically dependent on the inputs.

Several of the assumptions that were described in the advance notice were questioned in comments on the advance notice. These included the following:

Rebound Effect. NYSEO critiqued the existence of a "rebound effect" with more efficient refrigerators or television sets (NYSEO, No. 32, at 14–15). The Department believes that households respond to changes in operating expenses in three different ways. In the short run, they change the way they operate existing equipment, e.g., lower winter thermostat setting. In the long run, they also change equipment by switching from one fuel to another, and by improving the efficiency of their equipment, e.g., purchasing a more efficient water heater, or both. Thus, the elasticity of demand can be thought of as being separated into three elements—a usage elasticity, a technical efficiency elasticity, and an equipment/fuel choice (market share) elasticity. Household changes in equipment use in response to changes in fuel price and household income determine the usage elasticities. These elasticities are based on engineering possibilities and judgment in the original formulation of the ORNL model.[11] *See* Technical Support Document, Appendix B. DOE requests comments on the methodology and elasticities used and the appropriate values for the various elasticities, including usage elasticity (rebound effect).

In the analysis, the Department assumed that a more efficient refrigerator or television set would not be used more intensively because it is more energy efficient. Therefore, in estimating energy savings from different standard levels for refrigerators and television sets, the Department did not use a rebound effect. The Department does not have any data that consumers will use refrigerators and television sets any differently with changes in either energy prices or efficiency. However, the Department did include a "rebound effect" of 30 percent for small gas furnaces. *See* Technical Support Document, sections B.1 and B.6. The Department requests comments on the "rebound effect" for each product subject to today's proposal and for all space heating and cooling products, including the furnace categories not covered by this notice.

Discount Rate. NRDC and the CEC contended that the Department's use of five, seven and 10 percent discount rates was artificially high and would result in many capital-intensive candidate standard levels being excluded from consideration (NRDC, No. 19, at 21; and CEC, No. 35, at 7).

Since a dollar in the future is worth less than a dollar today, that future dollar must be discounted to determine its value today. If the discount rate chosen is too high, the present value of future dollars will be understated. Thus, higher discount rates tend to preclude more capital-intensive candidate standard levels. Nevertheless, the Department does not believe that the seven percent rate that was used in the analysis is artificially high. From the business perspective, a reasonable discount rate would be one that represented the private opportunity cost of capital used to meet any appliance conservation standard. A gauge of the private opportunity cost of capital is the most profitable alternative use of that capital. One measure of that cost could be the prime rate, that is, the interest rate that is offered by lending institutions to their most credit-worthy customers. In early October 1988, the prime rate was 10.0 percent. If such a business secured a loan at one of those rates of interest, and repaid it in the 1990–1995 time period, the real rate of interest would be 5.0 percent. This results because the expected annual rate of price increases in that time period is approximately five percent. Most businesses, however, are not eligible for loans at the prime rate of interest, so the estimated real rate of interest for these firms would probably be somewhat higher.

Similarly, from the consumer perspective, one approach to selecting an appropriate discount rate is to look at the interest payable on a consumer loan and depreciate that interest by the inflation rate. If a consumer secures a loan at 12 percent interest, and repays it in the 1990–1995 time period, the real rate of interest will be seven percent. Thus, DOE believes that from both the business and consumer perspectives, a seven percent discount rate is reasonable.

On the other hand, it may not be reasonable to require consumers to make an investment where there are inherent risks. For example, if consumers perceive a risk because of the uncertainty of energy prices and reliability and longevity of the equipment, they would require a greater return on their investment, i.e., a higher discount rate. It has been argued that the discount rate should be as high as 15 percent. Dubin and McFadden, "An Econometric Analysis of Residential Electric Appliance Holdings and Consumption," *Econometrica*, March 1984, pp. 345–361. DOE requests comments on the approach taken to select an appropriate discount rate, alternative approaches, and the consumer and business risks to be considered.

Several of the inputs, e.g., energy and equipment prices, were tested in sensitivity analyses to determine the effects of varying certain assumptions on the results of the analysis. By such sensitivity analyses, it is possible to determine those inputs where changes, including possible errors, are meaningful to the model's output, and those inputs for which changes are not meaningful. *See* the Technical Support Document, sections 4.3 and 5.4.

The savings attributable to the different standard levels are identified for each product in section III of this notice.

Modeling. Several comments offered suggestions on the LBL–REM modeling efforts. NYSEO and CEC critiqued the use of old data in LBL–REM in developing the baseline units for analysis. They contended that use of such old data could underestimate the impact that increased efficiency standards could have on saving energy. (NYSEO, No. 32, at 12; and, CEC, No. 35, at 3).

While some old data was used for the analysis of refrigerators, small gas furnaces, and television sets, these data points were merely the point of departure of the analysis. All of the data bases were updated to reflect current levels of efficiency in the marketplace, and, in the case of refrigerators, the baseline units were those with levels of efficiency that will be in the marketplace after the NAECA-imposed standards are in effect, i.e., after January 1, 1990. These data were then used to calculate annual energy consumption for the LBL–REM and life-cycle cost (LCC) analyses, based on the DOE test procedures. For example, in the LCC analysis, DOE used the test procedure annual average hours of use to calculate the annual cost of operation. This calculation does not account for variability in consumer usage patterns, nor does it reflect any changes in typical consumer usage behavior since the test procedures were developed. While the use of out-of-date usage values may affect the results of the LBL–REM and LCC analysis, DOE is not certain to what extent the results would be affected since, for example, the energy savings and net present value calculation of the LBL–REM would use

[11] Eric Hirst and Janet Carney 1978 "The Oak Ridge Engineering-Economic Model of Residential Energy Use," Oak Ridge National Laboratory, ORNL/CON–24.

the dated usage values in both the base case and standards case.

Several comments expressed confusion as to the difference between "baseline unit" and "base case." In the engineering analysis, the baseline unit for each product class under consideration is identified. These are units that are representative of units that are expected to be offered for sale in the beginning year of the analysis.[12]

Baseline refers only to the engineering analysis and is the first point identified in each cost-efficiency curve. It is the product to which design options are added to create more efficient units. On the other hand "base case" refers to the economic analysis forecast without standards for small gas furnaces and television sets, and for refrigerators, only those standards mandated by the Act.

2. *Significance of Savings*

Under section 325(1)(3)(B) of the Act, the Department is prohibited from adopting a standard for a product if that standard would not result in "significant" energy savings. While the term "significant" has never been defined precisely in the Act, the Department believes that a standard level option need not meet a threshold level of energy savings to be considered a "significant" saver of energy. The U.S. Court of Appeals, *NRDC* v. *Herrington, supra,* concluded that Congressional intent in using the word "significant" was to mean "non-trivial." *Id.* at 30. Thus, DOE believes that each candidate standard considered results in significant energy savings.

Two comments discussed the issue of significant energy savings. NRDC Noted that the use of engineering estimates to screen those design options that yield measurable energy savings is desirable and encouraged the Department not to establish (as it had in the past) a threshold of significance for energy savings. The Department has not established a significance threshold for energy savings. In addition, AHAM contended that, with regard to revision of refrigerator standards, if DOE found that incremental savings by the 1990 standards are "minor," the Department can "legally conclude that no revision is justified." (AHAM, No. 22, p. 7). DOE proposes that each candidate refrigerator standard saves a significant amount of energy.

[12] The baseline units for small gas furnaces and television sets are those with estimated average shipment-weighted energy factors (SWEF's) in 1987, while the baseline refrigerator units are ones with an estimated average SWEF in 1990.

d. Rebuttable Presumption

NAECA established new criteria for determining whether a standard level is economically justified. Section 325(1)(2)(B)(iii) states:

> If the Secretary finds that the additional cost to the consumer of purchasing a product complying with an energy conservation standard level will be less than three times the value of the energy savings during the first year that the consumer will receive as a result of the standard, as calculated under the applicable test procedure, there shall be a rebuttable presumption that such standard level is economically justified. A determination by the Secretary that such criterion is not met shall not be taken into consideration in the Secretary's determination of whether a standard is economically justified.

DOE believes that this provision means that if the added price of an appliance, caused by a conservation standard, would repay itself to the consumer in value of energy savings in less than three years, then it can be presumed that such standard is economically justified.[13] This presumption of economic justification can be rebutted by the seven factors of economic justification.

e. Economic Justification

As noted earlier, section 325(1)(2)(B)(i) of the Act, provides seven factors to be evaluated in determining whether a conservation standard is economically justified.

1. *Economic Impact on Manufacturers and Consumers*

The engineering analysis identified improvements in efficiency along with the associated costs to manufacturers for each class of product. For each design option, these costs constitute the increased per unit cost to manufacturers to achieve the indicated energy efficiency levels. Manufacturer, wholesaler, and retailer markups will result in a consumer purchase price higher than the manufacturer cost.

To assess the likely impacts of standards on manufacturers, and to determine the effects of standards on different-sized firms, the Department used a computer model that simulated hypothetical firms in the three industries under consideration. This model, the Lawrence Berkeley Laboratory Manufacturer Impact Model (LBL–MIM), is fully explained in the Technical Support Document. The LBL–MIM was formerly named the Lawrence Berkeley Laboratory Typical Year Model (LBL–TYM), which is the name that appeared in DOE's advance notice of this proposed rulemaking. LBL–MIM provides a broader array of outputs than the specified in the advance notice. The outputs are shipments, price, revenue, net income, and return on equity (ROE). An "Output Table" lists values for these in the base case and in each of the standards cases under consideration. It also gives a range for each of these estimates. A "Sensitivity Chart" shows how ROE would be effected by a change in any one of the model's nine control variables.

For consumers, a measure of economic impact is the life-cycle cost of a product, because it accounts for the increased first price, any increased maintenance expenses, and the reduced fuel expenses resulting from the product's greater efficiency. Under section 325 of the Act, life-cycle cost analysis is a separate factor to be considered in determining economic justification

2. *Life-Cycle Costs*

One measure of the effect of proposed standards on consumers is the change in life-cycle costs resulting from standards. This is quantified by the difference in life-cycle cost (LCC) between the base and standards case for the appliance classes analyzed. The LCC is the sum of the purchase price and the operating expense, including maintenance expenditures, discounted over the lifetime of the appliance.

The LCC is calculated at the estimated average efficiency for each class in the year standards are imposed using consumer discount rates of five, seven, and 10 percent. The purchase price is based on the factory costs in the Engineering Analysis, and includes a factory markup plus a distributor and retailer markup. As noted in the advance notice, energy price forecasts are inputs that are taken from the 1986 *Annual Energy Outlook* of the Energy Information Administration. Appliance usage forecasts are taken from the results of the LBL–REM. The Department seeks comments on the input to the LCC analysis including the discount rate and energy price forecasts.

The differences in life-cycle costs between the base case and various levels of standards for refrigerators and small gas furnaces are presented in Tables 6.1 through 6.3 of the Technical Support Document. These LCC's are calculated at a seven percent discount

[13] For this calculation, the Department calculated cost-of-operation based on the DOE test procedures. Therefore, the consumer is assumed to be "average" consumer as defined by the DOE test procedures. Consumers that use the products less than the test procedure assumes will experience a longer payback while those that use more than the test procedure assumes will have a shorter payback.

rate; a higher rate, e.g. 10 percent, gives a smaller difference, while a lower rate, e.g. five percent, produces a greater difference. As discussed above, it has been argued that discount rates as high as 15 percent should be used. The Department did not use 15 percent in the LCC analysis; however, as can be seen in the various LCC curves, the use of a higher discount rate would result in a flatter curve with the minimum life-cycle cost dropping, i.e., approaching the baseline unit. If a higher discount rate were used, e.g., 15 percent, and energy prices were lower than average, the minimum life-cycle cost point could be less efficient than the baseline unit.

When the LCC numbers are plotted graphically (on the Y axis) against unit energy consumption (on the X axis), the data generally produce a curve that is concave from above in shape. This means that at first the LCC curve will decline as efficiency improvements are made, will reach a minimum (which may or may not be discrete), and then rise. All this indicates is that the first efficiency improvements will produce energy savings, the value of which will more than pay for the design change. As efficiency improvements are made, it becomes increasingly costly to save more energy, and, eventually, the value of the energy savings will not cover the expenditures for the design improvements. *See* Technical Support Document, section 3.5.

The minimum of the LCC curve was of particular interest in the analysis. The minimum of the curve represents that level of efficiency improvements that maximizes the difference between the value of energy saved and the additional consumer expenditures for the relevant efficiency improvements. Therefore, design options that corresponded to the minimum point were of special consideration in establishing standard levels. Efficiency levels exceeding the LCC minima were generally rejected as standards as not being economically justified. At efficiency levels beyond the LCC minima, the incremental first cost of the product exceeds the value of the energy savings such that the average consumer does not realize a benefit from the investment.

The Department conducted a net present value (NPV) analysis to assess the differential economic impacts on consumers that would occur from the adoption of standards (for small gas furnaces and television sets) and amended standards (for refrigerators) compared to a base case with no-standards (for gas furnaces and television sets) and NAECA 1990 standards (for refrigerators). *See* Technical Support Document, Chapter 5. The LBL-REM calculates the total expenditure for each product (discounted total value of energy consumption from 1992 through the last year of use for those products purchased through the year 2015, plus the total discounted expenses for equipment purchased from 1992 through 2015) with and without standards (for televisions and small furnaces), and with more stringent standards and with NAECA 1990 standards (for refrigerators). The NPV analysis is similar to the LCC analysis, in that the greatest NPV should occur at the standard level that corresponds to the LCC minimum for the product.[14] The NPV for each product at the different standard levels is identified in section III of this notice. The NPV calculation, like the LCC analysis, is based on national average efficiency and usage values. This analysis does not take into account variations in energy prices and local usage rates. If for any product the covariances are zero, the results of the analysis will not be affected. If, however, the covariances are not zero, the results of the analysis will be affected. DOE does not have the data to determine if or to what extent the NPV calculation is affected by using average usage rates and energy prices. DOE requests comments on this issue.

3. Energy Savings

While the significant conservation of energy is a separate statutory requirement for imposing an energy conservation standard, the Act requires DOE, in determining the economic justification of a standard to consider the total projected savings that are expected to result directly from new or revised standards. DOE used the LBL-REM results, discussed earlier, in its consideration of total projected savings. The savings for the three products are provided in section III of this notice.

4. Lessening of Utility or Performance of Products

This factor cannot be quantified. In establishing classes of products and design options, the Department tried to eliminate any degradation of utility or performance in the three products under consideration in this rulemaking. That is, to the extent that comments or DOE's own research indicated that a product included a utility or performance-related feature that affected energy efficiency, a separate class with a different efficiency standard was created for that product. In this way the Department attempted to minimize the impact of this factor as a result of the standards that were analyzed. However, other factors, in conjunction with standards, could affect the utility or performance of products subject to standards. For example, the EPA limitations on CFC production could cause refrigerator manufacturers to adopt alternatives to the regulated CFC's which would affect the refrigerator's utility or performance. In this way, DOE is not able to assure that utility and performance could not be affected by standards.

Also, as discussed in section III of this notice, DOE was not able to establish separate classes for television features that provided a utility and which affected energy efficiency. DOE requests comments on the impacts that both legislated and revised standards could have on product utility and performance.

5. Impact of Lessening of Competition

It is important to note that this factor has two parts; on the one hand, it assumes that there could be some lessening of competition as a result of standards; and, on the other hand, it directs the Attorney General to gauge the impact of that effect, should it occur.

In order to assist the Attorney General in making such a determination, the Department studied the affected appliance industries to determine their existing concentrations, levels of competitiveness, and financial performances. This information will be sent to the Attorney General. *See* Technical Support Document, Chapter 7.

To afford the Attorney General the information that he may need to carry out his responsibility, we have forwarded copies of this notice and the Technical Support Document for his review.

6. Need of the Nation to Conserve Energy

One measure of the need of the Nation to conserve energy is the country's reliance on energy in the form of oil, especially imported oil. This was documented last year in a DOE report (*Energy Security: A Report to The President of The United States,* Washington, DC.: U.S. Department of Energy, March 1987.) In that report, U.S. energy security was essentially considered to be a function of free oil markets. The three products being considered here (namely, refrigerators, small gas furnaces, and television sets)

[14] The net present value (NPV) of a standard, per appliance, is calculated for all affected appliances that are purchased in the projection period, while the life-cycle cost (LCC) is calculated only for the lifetime of an appliance that is purchased in the first year of the relevant standard. Therefore, NPV and LCC estimates, per appliance, may not correlate exactly.

are all fueled by energy forms other than oil, specifically electricity for refrigerators and television sets, and natural gas for the small furnaces. While some oil is used to generate the electricity on which refrigerators and television sets operate, that is a very small part of our national energy picture. Specifically, only 5.5 percent of net electricity was generated by petroleum in 1986. Therefore, conservation of energy by these products will have little bearing on our national energy security.

7. Other Factors

This provision allows the Secretary of Energy, in determining whether a standard is economically justified, to consider any other factors that he deems to be relevant. The only such factor that has been identified is the EPA regulation to restrict the production of certain chlorofluorocarbons (CFCs).

III. Product-Specific Discussion

a. Refrigerators/Refrigerator-Freezers/ Freezers

1. Classes

In the advance notice, the Department discussed its methodology for reviewing the energy conservation standards established by the Act for refrigerators to determine if the standards should be amended. NAECA currently prescribes maximum annual energy consumption level for refrigerators based on the adjusted volume of the model. The equations are different for each of the seven classes of refrigerators and refrigerator-freezers, and three classes of freezers. These standards are to become effective January 1, 1990.

The following are the classes that are being reviewed for amended standards:

Refrigerators and Refrigerator-Freezers with manual defrost.
Refrigerators and Refrigerator-Freezers—partial automatic defrost.
Refrigerators and Refrigerator-Freezers—automatic defrost with:
- Top-mounted freezer without through-the-door ice service.
- Side-mounted freezer without through-the-door ice service.
- Bottom-mounted freezer without through-the-door ice service.
- Top-mounted freezer without through-the-door ice service.
- Side-mounted freezer without through-the-door ice service.

Upright Freezers with:
- Manual defrost.
- Automatic defrost.

Chest Freezers and all other freezers.

2. Design Options

The following is a list of a design options that were examined:

(i) *Refrigerators and refrigerator-freezers.*
(A) Foam insulation substitution in doors.
(B) Increased door insulation thickness.
(C) High-efficiency compressor substitution.
(D) Anti-sweat heater switch.
(E) Increased cabinet insulation thickness.
(F) Increased evaporator surface area.
(G) Adaptive defrost control.
(H) Fan and fan motor improvement.
(I) Improved foam insulation.
(J) Evacuated insulation panels.
(ii) *Freezers.*
(A) Foam insulation substitution in cabinet.
(B) Foam insulation substitution in door.
(C) Increased cabinet insulation thickness.
(D) Increased door insulation thickness.
(E) High-efficiency compressor substitution.
(F) Double door gasket.
(G) Adaptive defrost control.
(H) Fan and fan motor improvement.
(I) Improved foam insulation.
(J) Evacuated insulation panels.

3. Comments on the Advance Notice of Proposed Rulemaking

During the comment period on the advance notice, the Environmental Protection Agency (EPA) published a proposed rulemaking on December 14, 1987, concerning CFC production restrictions. 52 FR 47486. Recent findings regarding depletion of the earth's ozone layer have pointed to certain CFC's as the probable cause of that depletion. As part of an international agreement to halt that deterioration, the EPA proposed production restrictions on the most harmful of those CFC's. These rules were finalized on August 12, 1988. 53 FR 30566. Persons commenting on the advance notice with regard to refrigerators voiced concern about EPA's proceeding, since many of the design options that were under consideration by DOE involved CFC's. The following is a summary of comments concerning refrigerators.

The manufacturers and the trade association expressed concern for the ozone layer and recommended that DOE policy set the reduction of CFC's as a priority over energy conservation; to do otherwise would create potential conflict between two government agency rulemakings. (White Consolidated Inc. (WCI), No. 17, at 2; Whirlpool, No. 10, at 1; Admiral, No. 31, at 2; and AHAM, No. 22, at 16). Each recommended that DOE reject all design options that would require increased use of CFC's. (Whirlpool, No. 10, at 7; WCI, No. 17, at 1; Admiral, No. 31, at 2; and AHAM, No. 22, at 18). Whirlpool stated further that substitutes for CFC 11 and 12 would not be available for approximately five to seven years. (Whirlpool, No. 10, at 2.)

NRDC stated that DOE should establish more stringent standards in an effort to replace CFC technology with new forms of technology such as vacuum panel insulation or improved refrigeration cycles and that this would reduce industry need for CFC 11 or 12. (NRDC, No. 19, at 9.) The Solar Energy Association of Oregon (SEAO) supported this opinion. (SEAO, No. 30, at 1.) NRDC believes that DOE has the authority under section 325(b) of the Act to respond to industry demands for leadtime by establishing a two-tier level or extension to provide maximum technologically feasible standards. (NRDC, No. 19, at 12.)

NAECA established the review cycles to provide industry with sufficient time to respond to regulated standard levels set by DOE. Intermediate standard levels could require manufacturers to retool more than once in a five-year period. Therefore, the Department does not consider the imposition of intermediate standard levels between reviews to be practicable.

The EPA testified that, if promulgated, its proposed rule would not eliminate CFC 11 or 12 from production, but would impose reductions in CFC production over 11 years (EPA, Testimony). EPA stated that its proposed rule would allow for market-based CFC distribution and use, providing for a flexible regulation suitable to the needs of business and consumers. (EPA, Testimony).

SEAO recommended that DOE analyze and follow one of two courses of action concerning CFC issues. First, DOE could follow EPA's proposed rule and apply limited availability to the cost analysis. Alternatively, DOE could anticipate the further or more rapid reduction of CFC's production due to developments in research on the ozone layer. (SEAO, No. 30, at 2.)

In commenting on the advance notice, E. I. DuPont de Nemours and Company (DuPont) described its work on alternatives to CFC 11 and CFC 12. While the company has some promising alternatives, it does not expect to have them available in commercial quantities until late 1992, at the earliest; and, even then, the alternatives (HFC–134, HCFC–123 and HCFC–141b) will be less energy efficient as well as much more expensive. (DuPont, No. 48, at 1–2.)

At the public hearing on the advance notice, the NRDC urged that the Department not establish standards that would require use of more of the harmful CFC's, and also advocated that such CFC's be banned. (NRDC, Testimony.)

In mid-March 1988, the National Aeronautics and Space Administration (NASA) announced the results of a 19-year international study that concluded that the depletion of the earth's ozone

layer was more extensive than had previously been indicated. Specifically, the study found that stratospheric ozone has decreased by as much as three percent over densely populated areas of North America and Europe since 1969, as well as wintertime drops of more than six percent in Alaska and the Scandinavian countries, and that this ozone depletion had been caused by certain CFC and other chemicals.

In late March 1988, DuPont urged a total phaseout of the destructive CFC and indicated its intent to cease production of those CFC's at some unspecified date. In announcing the decision, the company cited the significant ozone depletion that was documented in the NASA report.

In September 1988, EPA reported that nothing short of a halt in the use of CFC's can save the stratospheric ozone layer from further dangerous depletion. EPA projects a more extensive and faster-moving threat than previously realized. DOE's analysis does not consider the possibility that CFC's could be banned altogether. Furthermore, the possibility of a ban in CFC use is an example of the reason why DOE needs to exercise care in prescribing standards. For example, DOE is prohibited by NAECA from reducing the stringency of standards.

Because of limitations imposed on CFC's, whether by reduction in production levels or by production bans, refrigerator manufacturers may be required to utilize alternatives to the restricted CFC's to achieve energy efficiency requirements. DOE cannot be certain, however, that the new product would have the same utility or performance or be able to achieve the same level of energy efficiency. If standards are set at a level that, as a result of these or other factors, cannot be attained, the standards could have an adverse effect on manufacturers and consumers, since DOE is prohibited by NAECA from reducing the stringency of standards.

The Department believes that under present EPA regulations, there will be substitutes for CFC–11 and CFC–12, but with a cost and energy efficiency penalty. In addition, questions exist regarding the ability of appliance manufacturers to accommodate new refrigerants in their production processes. For example, if the new refrigerants are not as energy efficient as the CFC's being replaced, it would mean that more of them would be needed to achieve the same level of savings; and, this could result in a need to alter the refrigerator design in order to accommodate the substitute materials. Under these circumstances, any change in the need for CFC's could result in altering the expected results of the analysis by, for example, adversely affecting the estimates of manufacturing costs, consumer prices, and so on.

The Department is examining all design options, including those using CFC's. CFC's, while being reduced in quantity, are not banned from production. Supplementary information provided through DOE research shows that the residential refrigerator industry consumption of CFC–11 and CFC–12 currently represents approximately two percent of all consumption of the regulated CFC's.[15]

The engineering baseline unit for refrigerators was identified in the advance notice as the same unit used in the April 1982 proposal. The CEC and AHAM expressed concern that the data were too old for current use and that DOE should use a representative model. (CEC, No. 35, at 3; and AHAM, No. 22, at 27.)

DOE agrees, and has used as the baseline for each class, a refrigerator with a SWEF near that which is expected to prevail after the 1990 NAECA standards are in effect.

AHAM stated that data provided to LBL on 1987 refrigerator models had no single set of design options used by manufacturers to accomplish energy goals, making it difficult to identify a baseline unit. (AHAM, No. 22, at 27.) Furthermore, AHAM suggested removing from consideration, in this rulemaking, those design options that would be used to accomplish the 1990 standards. (AHAM, No. 22, at 28.) The Department did not include such design options in this analysis.

NRDC submitted data on the LaBrecque Cycle, as a possible means to shift from CFC–12 to CFC–22. (NRDC, No. 19, at 19.) While DOE agrees that this technology is a theoretical possibility, the Department has no knowledge of any prototype or laboratory assembly that demonstrates its potential. Furthermore, DOE does not have data to conclude that this technology could be adopted as a prototype by the time of the amended standard's 1993 effective date. Therefore, DOE did not include this technology in the engineering analysis.

NYSEO recommended that DOE investigate different configurations, changes in unit dimensions, number and location of doors, rotary compressors as well as conducting research into Japanese methods of refrigerator manufacturing. (NYSEO, No. 32, at 7.) DOE believes that the number and location of doors and dimensions of a refrigerator may have utility implications to the consumer, but it is uncertain whether there is any impact on energy efficiency. Many refrigerators are used as replacements and must therefore fit into the space used by previous models, which can make dimensions very restrictive. The concept of using rotary compressors as one of the design options is a good one. However, DOE believes that considering design options by compressor efficiencies, e.g., 5.0 or 5.3 energy efficiency ratio, rather than by design e.g., rotary compressor, allows manufacturers to select the appropriate compressor design.

The CEC was concerned that some design options will be incorporated to reach the 1990 standard levels, and should not be used again to evaluate 1993 levels. Also, the CEC requested that DOE identify the method of combining design options. (CEC, No. 35, at 6.)

The Department combined design options by beginning with those designs that were most cost-effective for consumers, and then adding progressively less cost-effective ones.

DOE has determined that certain design options will be part of the 1990 standard level design, and are in some current models, therefore, they are being treated as part of the base case for 1990. These options are: Foam insulation substitution in freezer section doors: and antisweat heater switch.

One design option, evacuated insulation panels, was mentioned throughout the comments as an energy saver that could also eliminate the need for CFC–11 in refrigerators. NRDC commented that evacuated panels have been researched in many forms, all showing high potential for saving energy. (NRDC, No. 19, at 17). AHAM provided information from its investigation of Japanese use of evacuated panels in refrigerators. AHAM stated that the models were discontinued, and speculated that it was due to concerns about a combination of cost, reliability and incompatibility with the manufacturing process. (AHAM, No. 22, at 31).

DOE has funded research at the Solar Energy Research Institute (SERI) and Oak Ridge National Laboratory (ORNL) to develop U.S. technology in evacuated panels. Completion of this research is expected to take approximately five years; however, independent research or

[15] "The Use of Chlorofluorocarbons in Refrigeration, Insulation and Mobile Air Conditioning in the United States," Terry G. Statt, DOE, paper prepared for EPA Conference on Substitutes and Alternatives to CFC's and Halons. Washington, DC, January 13–15, 1988.

a major breakthrough may bring this technology into place prior to 1993. Nevertheless, DOE believes that to specify standards that would require evacuated panel insulation in 1993 would be beyond the ability of the manufacturers to carry out commercially acceptable redesign and retooling successfully. Therefore, DOE is retaining evacuated insulation panels as a design option but proposes that it is not technologically feasible for implementation of 1993 standard levels. DOE believes that the scheduled reductions in CFC production will inspire industry to research non-CFC technology such as evacuated panels and provide prototypes and limited production models for the next review process of refrigerators.

Whirlpool requested that DOE evaluate the possible development of two new classes for refrigerators. The first is an all-refrigerator with automatic defrost and the second is for built-in refrigerators. Whirlpool recommended that the standard level for an all-refrigerator with automatic defrost be equivalent to a refrigerator-freezer, top mount, with automatic defrost and that the standard level for a built-in be approximately 10 to 15 percent above the non built-in class. (Whirlpool, No. 10, at S–6). AHAM supported the adoption of the all-refrigerator with automatic defrost class. (AHAM, No. 22 at 26).

DOE proposes to include the all-refrigerator with the class of top-mount, automatic defrost refrigerator-freezer. However, DOE does not have any information to conclude that built-ins, which provide utility to the consumer, affect energy consumption. Thus, DOE is not proposing a separate class for built-in refrigerators. DOE invites comments and data concerning the adoption of these classes.

4. Efficiency Levels Analyzed

DOE examined a range of standard levels, including the 1990 NAECA standards. As discussed above, the impacts of any revised standards were compared to the 1990 NAECA standards; therefore, the impacts of the base case are generally not presented because they are calculated to be zero.

Table 3–1 presents the efficiency levels, other than the base case, selected for analysis for 1993. Alternate levels were selected to generate a range of impacts for analysis. Initially, the levels were selected for the class of top-mount, automatic defrost refrigerator-freezer without through-the-door ice service. Level 5 corresponds to the highest efficiency level considered in the engineering analysis. It was felt that manufacturers eventually can produce appliances at this efficiency. Level 4 generally corresponds to the minimum life-cycle cost point. Levels 1 through 3 correspond to efficiencies lower than that of level 4. Each level was analyzed discretely in the engineering analysis. Standard levels for each of the other classes of refrigerators was based on the combination of design options for the top mount, automatic defrost refrigerator-freezer without through-the-door ice service.

TABLE 3–1.—ALTERNATIVE EFFICIENCY LEVELS FOR 1993 FOR REFRIGERATORS AND REFRIGERATOR-FREEZERS AND FREEZERS
[ENERGY CONSUMPTION KWH/YR.]

Product class	1	Level analyzed		4	5
		2	3		
Refrigerators and Refrigerator-Freezers with manual defrost	14.4 AV+287	12.3 AV+272	11.9 AV+258	10.6 AV+245	8.0 AV+245
Refrigerator-Freezers—partial automatic defrost	16.7 AV+333	15.2 AV+317	14.1 AV+305	12.5 AV+290	8.9 AV+273
Refrigerator-Freezers—automatic defrost with:					
Top-mounted freezer without through-the-door ice service [1]	19.3 AV+384	17.8 AV+372	16.8 AV+363	14.4 AV+334	10.0 AV+306
Side-mounted freezer without through-the-door ice service	14.8 AV+572	13.5 AV+547	13.1 AV+540	10.9 AV+497	6.9 AV+426
Bottom-mounted freezer without through-the-door ice service	21.1 AV+410	19.1 AV+499	17.9 AV+386	15.2 AV+353	10.5 AV+321
Top-mounted freezer with through-the-door ice service	20.5 AV+409	18.9 AV+395	17.6 AV+380	14.8 AV+343	10.2 AV+313
Side-mounted freezer with through-the-door ice service	17.2 AV+662	15.7 AV+635	15.2 AV+625	12.8 AV+582	8.1 AV+517
Upright Freezers with: Manual defrost	14.7 AV+213	13.2 AV+191	12.3 AV+181	10.4 AV+177	7.0 AV+157
Automatic defrost	20.7 AV+300	19.2 AV+277	18.0 AV+264	14.8 AV+252	9.7 AV+216
Chest Freezers and all other freezers	12.8 AV+186	12.0 AV+173	11.2 AV+163	9.4 AV+159	7.0 AV+157

[1] Including all refrigerators with automatic defrost.

Payback Period. Table 3–2 presents the payback period for the efficiency levels analyzed for the most prevalent class of product (20.8 cubic foot adjusted volume, automatic defrost refrigerator-freezer). Standard level 1 involves efficiencies achievable with foam door insulation and a 5.0 compressor, level 2 involves additional efficiencies achievable with K=0.11 foam insulation, level 3 substitutes a 5.3 compressor, level 4 substitutes K=0.10 foam insulation and adds more efficient fans as well as 2 inches of door insulation, and level 5 adds adaptive defrost and evacuated panel which the additional expense of purchasing a product at this efficiency level will be less than three times the value of the energy savings that the consumer will receive during the first year. The payback period for refrigerators that meet standard level 1 efficiency ranges from a low of 0.6 years for a side-by-side refrigerator-freezer with through-the-door services to a high of 2.0 years for a manual defrost chest freezer; the payback period for refrigerators that meet standard level 2 efficiency ranges from a low of 0.9 years efficiencies. For most classes, standard level 3 corresponds to the most stringent energy conservation standard level at for a side-by-side refrigerator-freezer without through-the-door services to a high of 1.9 years for a manual defrost chest freezer; the payback period for refrigerators that meet standard level 3 efficiency ranges from a low of 1.3 years for an upright, automatic defrost freezer to a high of 2.9 years for a manual defrost, chest freezer; and, the payback period for units that meet level 4 efficiency ranges from 2.7 years for an automatic defrost refrigerator-freezer with side freezer and through-the-door services to 4.1 years for a chest freezer. *See* Technical Support Document Table 3.31 through Table 3.40.

TABLE 3-2.—PAYBACK PERIODS (YEARS) TOP MOUNT AUTO DEFROST REFRIGERATOR-FREEZER, WITHOUT THROUGH-THE-DOOR FEATURES

[Adjusted Volume=20.8 Cu. Ft.]

Standard level	Payback period
1	0.9
2	1.1
3	1.7
4	2.1
5	5.4

Significance of Energy Savings. By the year 2015, the weighted average energy consumption of new refrigerators sold in absence of revised standards is not projected to change compared to 1990 when the legislated standards become effective. This is because residential electricity rates are projected to decline from 1984 to 1995, then increase, reaching 1983 levels by 2015 (in real terms). Without upward pressure on operating expenses, the LBL–REM projects that there will be no major energy consumption improvements. When revised energy conservation standards are imposed, the LBL–REM projects that over the period 1992–2015, the following savings would be attributable to the increased standards:

Level 1—3.8 Quads
Level 2—5.1 Quads
Level 3—5.9 Quads
Level 4—8.1 Quads
Level 5—11.6 Quads

(*See* Technical Support Document, Table 5.8.)

On the basis of the above, DOE believes that the increased standard levels considered for refrigerators would result in a significant conservation of energy. However, DOE believes that the LBL–REM base case projections of no improvement in the efficiency of refrigerators compared to 1990 is unlikely. Over the last two decades the average efficiency of refrigerators has increased over 50 percent. During this time, the nation experienced both declining and increasing real energy prices. DOE believes there is no reason to conclude that the average efficiency of refrigerators will not continue to increase. Changes in SWEF can be brought about by a number of factors including heightened consumer awareness.[16] DOE requests comments on this issue, particularly the LBL–REM's forecast of refrigerator efficiency.

Economic Justification—A. Economic Impact on Manufacturers and Consumers. The per unit increased cost to manufacturers to meet the level 3 efficiency ranges from $12.60 for a 22.5 cubic foot (adjusted volume (AV)) chest freezer to $15.90 for a 31.9 cubic foot AV automatic defrost refrigerator-freezer with side freezer and through-the-door services. The cost for the most prevalent class of product (automatic-defrost refrigerator-freezer with top-mounted freezer) would increase $13.20. For level 4 efficiency, the per unit increased cost to manufacturers to meet that efficiency ranges from $22.40 for a 26 cubic foot chest freezer to $36.80 for a 31.9 cubic foot automatic defrost refrigerator-freezer with side freezer and through-the-door services. The cost for the most prevalent class of product (automatic-defrost refrigerator-freezer with top-mounted freezer) would increase $33.20. The per unit increased cost to manufacturers to meet the level 1 efficiency ranges from $4.60 to $6.90, while level 2 cost increases range from $7.70 to $10.30. For level 5, the cost increases from $47.30 to $79.60. *See* Technical Support Document, Tables 3.14 through 3.23.

The LBL–MIM, in the base case, projects manufacturers long-run return on equity (ROE) to be 9.54 percent for refrigerators and refrigerator-freezers and 8.25 for freezers. At level 3, the LBL–MIM predicts that a prototypical refrigerator and refrigerator-freezer manufacturer would have a gain in its ROE to 10.59 percent, a gain of 11.0 percent. At level 4, the manufacturer's ROE is expected to increase to 10.56 percent, a 10.7 percent gain. The corresponding gains for freezer manufacturers are 15.5 percent at level 3, and 6.9 percent at level 4. At levels 1 and 2, the refrigerator and refrigerator-freezer manufacturers' ROE are expected to improve respectively, to 10.08 percent (an improvement of 15.6 percent) and to 10.32 percent (an improvement of 8.2 percent). For freezer manufacturers, the ROE is expected to improve to 8.99 (an improvement of 12.8 percent) for levels 1 and 2, respectively. *See* Technical Support Document, Tables 7.9 and 7.10.

These industries have displayed periods of increasing consolidations that have been especially pronounced during periods of low earnings. By increasing profitability, as DOE projects, standards could lead to a reduction in the rate of such consolidations, thereby possibly contributing to more robust competitiveness than is likely in the base case. The increase in profitability is directly related to the LBL–REM projection of shipments. Shipments under standards are projected to increase slightly. *See* Technical Support Document, Table 5.34. If shipments were to decrease, however, the LBL–MIM's projection of ROE would likely decrease, resulting in reduced profitability and possibly increase industry concentration.

The Department's characterization of the prototypical manufacturer in the base case assumes that manufacturers' typical refrigerator, refrigerator-freezer and freezer designs are based on the combination of options presented in the Engineering Analysis for the baseline unit. If manufacturers use a different combination of design options to produce refrigerators that minimally comply with the 1990 NAECA standard, the Department may have inappropriately characterized the financial position of the prototypical manufacturer in the LBL–MIM. Furthermore, since financial data of the type needed to characterize the prototypical manufacturer are generally not available, DOE had to make a number of assumptions based on the limited data publically avaiiable, e.g., Securities and Exchange Commission 10K reports and company annual reports. Finally, DOE assumed that manufacturers would have sufficient quantities of the regulated CFC's. Because of the significant impact these assumptions could have on the results of the analysis, DOE requests comments on these issues, particularly from small manufacturers.

The sensitivity analysis, however, indicates the refrigerator, refrigerator-freezer and freezer industry is sensitive to price and operating expense elasticities. For example, the high price and low operating cost scenario indicates that the effects of standards would be to decrease return-on-equity for refrigerator, refrigerator-freezer and freezer manufacturers by nearly 1.5 percent and nearly 2.0 percent for freezers. *See* Technical Support Document, Tables 7.17 and 7.18. While these scenarios are theoretically possible, the Department expects that the original analysis will be the likely outcome.

For consumers, standard level 3 would cause price increases that would range from a low of $22.62 for an automatic defrost, upright freezer, to a high of $39.36 for an automatic defrost, side-by-side refrigerator-freezer. The corresponding range of price increases at standard level 4 would be a low of $48.13 for a manual defrost, chest

[16] On June 13, 1988, FTC published proposed rules to amend the appliance labeling program. (53 FR 22106). In particular, FTC requested comments on amendments to refrigerator labeling. Changes to the refrigerator label could increase consumer awareness of energy consumption.

freezer and a high of $96.70 for an automatic defrost, side-by-side refrigerator-freezer. *See* Technical Support Document, Tables 3.31–3.40.

B. *Life Cycle Cost and Net Present Value.* The LCC analysis indicates that for each possible standard level the increase in purchase price would be offset by savings in operating expenses. Standard level 4 generally corresponds to the minimum for each of the life-cycle cost curves. *See* Technical Support Document, Figures 3.13–3.22. This indicates that the standard level would not cause any economic burden on the average consumer. DOE examined the effect of different discount rates, 5, 7 and 10 percent, on the LCC curves and generally found little impact; however, the Department did not consider higher discount rates. Similarly, DOE did not consider different energy prices, including regional prices, or different usage rates in the LCC analysis.

The LBL–REM employs national average energy prices and usage rates. The appropriateness of this approach depends on the relationship between energy prices and consumer choice of efficiency levels and the relationship between consumers' expected usage and choice of energy efficiency level. If those consumers who face higher energy costs and/or expect to use their refrigerators more intensively, are on average, more likely to buy higher efficiency refrigerators, then a modeling approach that assumes that national average energy prices and usage rates apply to all consumers will yield results that overstate the net benefits that could be expected. The Department requests comments on the effects of energy prices and expected usage rates on consumer's choice of efficiency level as well as the potential biases that may be introduced by using national average energy prices and usage rates.

The net present value (NPV) analysis indicates that if a standard were adopted at level 3, there would be a net present value of $12.2 billion from energy savings over the period 1992–2015. At level 1, the corresponding NPV would be $8.5 billion, at level 2, $11.0 billion and at level 4, the corresponding NPV would be $13.9 billion. *See* Technical Support Document, Table 5.14. If, as discussed above, the NPV were calculated based on a 15 percent discount rate, the NPV at level 3 would be $2.5 billion; significantly less than calculated at seven percent.

C. *Energy Savings.* As discussed above, DOE proposes that standards, at each candidate standard level, would result in a significant saving of energy. The Department conducted several sensitivity cases, one of which was to assume that after 1990, the market would produce refrigerators of an efficiency that increases more than the standards would otherwise require.

The base case projects that there will be no increases in the SWEF of refrigerators after 1990, i.e., that the private sector will not continue to improve the efficiency of these appliances beyond the mandated levels. The sensitivity case assumes that after the 1990 standards are in place, the base case efficiency growth, instead of being flat or zero, will occur at some positive rate. The Department believes that the maximum improvement in market-induced refrigerator energy efficiency after 1990 would be that amount that would be characterized by the historical improvement in such efficiency. It would not be reasonable to assume that energy efficiency would improve at a greater than historical rate.

Therefore, the Department believes that the range of market-induced efficiencies that would occur after 1990 in the absence of additional Federal standards would be from a low or no improvement to a high of an historical average growth rate.

It is important to note that the energy savings results for refrigerator standards may overstate the results that would otherwise obtain. For example, as indicated above, the maximum savings attributable to standards on refrigerators would be 11.6 Quads of electricity. This level would require the use of evacuated panels in place of foam insulation. If, however, base case efficiency growth were to occur at its historical average rate, the LBL–REM projects that savings from standards would be reduced by as much as 4.09 Quads, i.e., 11.6 Quads minus 7.51 Quads over the 1992–2015 period. See Table 3.3. Similarly, the energy savings could be affected if a regional analysis, including regional energy prices and varying usage rates, were used. DOE did not perform this analysis because the Department does not have data to indicate that regional values would have an effect on energy savings due to standards.

TABLE 3–3.—SENSITIVITY ANALYSIS: CUMULATIVE ENERGY CONSUMPTION OF REFRIGERATORS, REFRIGERATOR-FREEZERS, AND FREEZERS IN THE PERIOD 1992–2015 (QUADRILLION BTU, PRIMARY)

[High efficiency sensitivity case]

Base case	Standard			Difference		
	Level 3	Level 4	Level 5	Level 3	Level 4	Level 5
41.64	39.41	37.52	34.13	2.23	4.12	7.51

D. *Lessening of Utility or Performance of Products.* As indicated above, DOE established classes of products in order to assure that the standards analyzed would not lessen the existing utility or performance of refrigerators. However, there is no assurance that future utility or performance of refrigerators would not be lessened as a result of disincentives caused by standards to investments in energy-using new features or as a result of redesign brought about by EPA's regulations affecting CFC production.

E. *Impact of Lessening Competition.* Since standards generally would result in greater industry profitability, and since historically in this industry mergers have resulted during periods of low profitability, one result of standards could be to reduce the rate of industry consolidation, therby leading to more competition than is likely under the less profitable base case. DOE concludes from the results of the LBL–MIM that standards could lead to a reduction in the rate of consolidation; therefore, standards would not lessen competition. However, this conclusion is based on DOE's forecast of increased ROE. DOE requests comments on the impact of standards, both legislated and possibly amended, on competition.

F. *Need to Save Energy.* Refrigerators use electricity as their energy source. Nearly seven percent of the nation's total electricity (which required source energy of 27.6 Quads in 1987) powers refrigerators, and nearly 13 percent of that seven percent would be saved by standards for this product at level 3, while almost 18 percent of that seven

percent would be saved at level 4. Levels 1 and 2 would save 8 and 11 percent respectively. The sensitivity analysis on the LBL–REM indicates that even if market improvements and consumer awareness of appliance efficiency continues, the projected savings at level 3 would be nearly 5.5 percent of that seven percent, while the savings at level 4 would be nearly ten percent of that seven percent.

G. *Other Factors.* In the Design Option discussion above, it was explained that many design options considered by DOE require the use of additional amounts of CFC, either CFC–11 or CFC–12. Both of these refrigerants are subject to an EPA rulemaking that would place restrictions on the manufacture of certain CFCs.

As noted above, the use of CFC's in the manufacture of refrigerators currently accounts for approximately two percent of the restricted CFC's. The 50 percent reduction in CFC manufacture prescribed by EPA, will likely result in the use of CFC's in refrigerators to exceed five percent of U.S. consumption. This increase in the percentage of CFC consumption accounted for refrigerators would be a result of the CFC production restriction along with increased CFC use to meet the legislated 1990 standards, and increased sale of these products. Presently, DOE is unaware of any currently available alternatives to CFC–11 or CFC–12 that have been demonstrated as acceptable replacements to the affected CFC's. However, likely alternatives have been identified, but have not been subjected to complete evaluation, including toxicology tests. Based upon the comments on the advance notice, DOE assumed that suitable alternatives will be developed; however, the schedule by which these alternatives will become available in sufficient quantities is unknown at this time. DOE believes that most of the increase in CFC usage will be made in order to meet the 1990 NAECA standards. Of the design options considered to meet standard levels 1 through 3, only the addition of foam doors for refrigerators and refrigerator-freezers (level 1) would require significant amounts of the affected CFC's. However, in order to meet the 1990 NAECA standards, manufacturers could consider the adoption of design options not included in DOE's baseline unit, including thicker walls. If manufacturers were to adopt this approach, substantially more CFC's would be required than the Department assumes. Furthermore, under this scenario, the supply of CFC's may not meet the demand at any standard level including the 1990 NAECA level. The impacts of the EPA rulemaking on CFCs are not specifically reflected in the LBL–MIM. DOE solicits comments on this issue, especially concerning the baseline unit and manufacturers' ability to meet the 1990 NAECA standards. DOE is particularly interested in receiving comments from small manufacturers of refrigerators.

Conclusion. After careful consideration of the analysis, the Department is proposing a revision of the refrigerator standards from a range of standards that includes continuing the 1990 NAECA standards to standard level 3. The Department proposes that each candidate standard level for refrigerators saves a significant amount of energy, and is economically justified. However, because of the analytical and policy questions discussed above, the Department is not proposing specific standard levels within the above range. Rather, DOE is presenting the results of the analysis and is soliciting additional comment and information to be considered in promulgating the final rule. The final rule will specify a specific level for refrigerators; the level selected could include no change to the 1990 NAECA standards.

As discussed above, DOE's analysis indicates that there would be substantial energy savings at each candidate standard level of efficiency. During the period 1992–2015, these savings would be nearly six Quads of primary electricity per year compared to the base case for level 3, five Quads for level 2 and nearly four Quads for level 1.

Although these standards would cause some increase in the initial price to the consumer, each standard is calculated to reduce substantially the typical consumer's life-cycle costs. In addition, of the standard levels analyzed, level 3 was the most stringent level that satisfied the rebuttable presumption test, i.e., that had a value of energy savings that repaid the initial purchase price increase to the average consumer in less than three years.

The technologies that may be necessary to meet each standard, level 1–3, will likely be available by 1993. These include compressors of near 5.3 EER. For manufacturers, level 3 standards are expected to produce long-run increases in their net income and return on equity of 18.2 percent and 11.0 percent, respectively. Levels 1 and 2 will result in similar increases.

Each standard level may involve the use of additional amounts of ozone-depleting CFC's; however, DOE believes this additional amount will come at the expense of other products that presently use the needed CFC's. If, however, EPA were to halt the production of CFC's, manufacturers would have to find alternatives to both CFC–11 and CFC–12. It has not been conclusively demonstrated to what extent, if any, alternatives would penalize the energy efficiency performance of refrigerators. Furthermore, if the standards were to be revised and it were to be shown that the CFC alternatives did have an efficiency penalty, DOE would not be able to adjust the standard downward.

In the base case (1990 NAECA standards), DOE believes the analysis likely underestimates the impacts of the 1990 NAECA standards. As discussed above, the Department believes that the LBL–REM overestimates energy consumption by forecasting no increases in refrigerator SWEF. Also, the characterization of the prototypical manufacturer in the LBL-MIM does not account for the possible impacts of the EPA's regulations concerning CFC manufacture, since the Department assumed that sufficient quantities will exist after the regulations go into effect.

In addition, not amending the 1990 NAECA standards would allow manufacturers time to adjust to the standards; would not increase refrigerator CFC use; and would allow time for research on alternative, lower CFC-using technologies.

For standard level 3, the Department proposes that there will be a significant conservation of energy and that the standards are projected to have little economic impact on manufacturers. Standards at this level would likely be met with existing technology and would reduce consumer life cycle costs. However, standards at this level would require the use of more CFC's and would increase prices to consumers. Furthermore, as discussed above, the LBL-REM forecast of energy savings is likely to be overestimated. The standards analysis may also underestimate the impact on manufacturers, since many are already involved in retooling to meet the 1990 NAECA standards and the EPA's CFC restrictions.

For standard level 2, the Department proposes that there will be a significant conservation of energy and that the standards will cause little increase in price to consumers. In addition, the analysis projects little economic impact on manufacturers and a substantial reduction in consumer life cycle costs. However, standards at this level will require the use of more CFC's. Also, the analysis may underestimate the economic impacts on manufacturers as

discussed above and it likely overestimates energy savings.

For level 1, the Department proposes that there will be a significant conservation of energy and that the standards would likely have little economic impact on manufacturers and consumers. In addition, the standards would substantially decrease consumer life cycle costs compared to the 1990 unit. However, significant improvements in efficiency are technologically feasible. Also, standards at this level would result in some increase in CFC use in refrigerators, and the impacts on manufacturers and energy savings estimates may be incorrect as described above.

The results of the analysis, including those for levels 1, 2, and 3 discussed above, could change if a different discount rate were used, energy prices drop, or if the use of national average energy prices and appliance usage rates introduces a bias. Furthermore, if amendments to the appliance labeling program are finalized by FTC, it could improve the effectiveness of the program, thereby reducing any benefits of standards. 53 FR 22106, June 13, 1988. DOE believes that programs such as the labeling program are preferable to standards since they result in the least amount of intervention in the marketplace and do not preclude products that may be the optimum for certain consumers.

More stringent standard levels were examined and rejected for the following reasons: First, the level 5 standard, the maximum technologically feasible option, involved the use of evacuated panels. While evacuated panels have existed for some time, and were previously even used in some Japanese refrigerators, the technology has not yet proven to be a reliable and durable one, and one suitable for mass production. Furthermore, even though one domestic manufacturer has patented an evacuated panel technology, there are no reasonable assurances that a reliable and durable evacuated panel design will be available when this standard is to be effective. Therefore, the Department has rejected this standard level. Moreover, in most cases this point is beyond the minimum life-cycle cost point which would prevent some consumers from being able to purchase the most cost-effective units for them.

Level 4 standards would involve a substantial increase in the initial consumer price of refrigerators; in fact, the improvements necessary to reach that level of efficiency are estimated to be so costly that the rebuttable presumption consideration is not satisfied for the most prevalent class. In addition, results of the engineering analysis and the life-cycle cost analysis indicate that while there is a substantial increase in the price of refrigerators between level 3 and 4, the corresponding decrease in operating costs results in a negligible life-cycle cost difference between these levels. Furthermore, this standard level assumes the use of more ozone-depleting CFC than the level 3 standard.

b. Small Gas Furnaces

1. Classes

Two classes of small gas furnaces,[17] weatherized (outdoor) and non-weatherized (indoor), were specified in the advance notice.

These classes are distinguished by their ability, or inability, to be installed outdoors, a performance-related feature that affects utility and efficiency. The weatherized (outdoor) furnace provides the owner with the utility of saving indoor space. The weatherized furnace typically is less energy efficient than a comparable nonweatherized (or, indoor) furnace because the "jacket" energy losses of a weatherized furnace will usually exceed the infiltration energy losses of an indoor furnace. The test procedures for furnaces recognize these differences and prescribe different efficiency calculation methods for these two types of furnaces.

2. Design Options

The Engineering Analysis identifies individual or combinations of design options with a potential for improving energy efficiency. Design options that are on the market, or that will be on the market by the time standards are effective, were considered. The following is a list of design options that were examined:

(A) Increased heat exchanger surface area.

(B) Intermittent ignition device (IID).

(C) Power burner or power vent.

(D) Increased insulation.

(E) Additional improvement of steady-state efficiency.

(F) Two-stage and modulating burners.

3. Comments on the Advance Notice of Proposed Rulemaking

Comments from the Edison Electric Institute (EEI) suggested that in evaluating the small furnace standard (between 71 and 78 percent AFUE), the Department consider the base case not to be the no regulation case, but rather the 78 percent case. In addition, EEI suggested that the Department examine 71 percent AFUE, 78 percent AFUE (as the base case), and two levels higher than 78 percent. (EEI, No. 20, at 3–4).

The Department rejects the idea of a base case at 78 percent AFUE since that would preclude the ability to show any energy savings at 71 percent AFUE and, therefore, it would *a priori* exclude the 71 percent AFUE case from consideration. As to EEI's other suggestion, DOE believes it would serve no purpose in this proceeding to examine two standards cases of efficiencies greater than 78 percent AFUE since the Act precludes DOE from setting a standard greater than 78 percent AFUE.

The American Gas Association (AGA) and Alabama Gas Association (AlG) maintained that the use of life-cycle cost (LCC) analysis is inappropriate in the small gas furnace market since much of the decision-making on new purchases is made by builders and contractors whose purchase decisions are influenced principally by initial price considerations. (AGA, No. 24, at 1; and, A1G, No. 8, at 3 and 6). Conversely, CEC suggested that the Department develop LCC curves for each product. (CEC, No. 35, at 6).

Indeed, while much of the small furnace market demand comes from builders and contractors, consumer life-cycle cost analysis is still appropriate since section 325(1)(2)(B)(i)(II) of the Act requires DOE, in determining whether a new or amended standard is economically justified, to "determine whether the benefits of the standard exceed its burdens by, to the greatest extent practicable, considering the savings in operating costs throughout the estimated average life of the covered product in the type (or class) compared to any increase in the price of, or in the initial charges for, or maintenance expenses of, the covered products which are likely to result from the imposition of the standard."

The AGA stated that the LBL–REM model disregards regional variations in housing unit growth rates (AGA, No. 24, at 15). The AGA is incorrect, since the inputs to LBL–REM include forecasts of regional housing starts. Specifically, LBL–REM's updated housing submodel includes several features:

(1) The model uses population projections, which are more stable than

[17] The Act requires the Department to establish minimum energy conservation standards for gas furnaces (other than furnaces designed solely for installation in mobile homes) having an input of less than 45,000 Btu per hour. The Department interprets this provision to be applicable only to gas, forced-air furnaces.

projections of housing completions because of the comparatively larger influence of economics, e.g., the stage of the business cycle, interest rates, and so on, on housing completions. In the long run, the number of housing units available is expected to agree with the need for housing units, which is determined by the size and composition of the population.

(2) The updated method utilizes population projections for states by house type. This feature, combined with climate data, permits estimation of the fraction of households with heat loads that could be met by small gas furnaces.

(3) Projections of the numbers of people in each age group in future years are used to project changes in the distribution of house types.

Lastly, with regard to the utility impact analysis, Lone Star Gas Company (LSG) and EEI suggested that the utility analysis examine the impact on gas, as well as electric, utilities. (LSG, No. 11, at 6; EEI, No. 20, at 6).

No direct analysis of gas utilities was performed, but impacts on residential gas sales were estimated. The Department believes that this is adequate to assess the gas utility impacts from standards on small gas furnaces that are intended for residential use, since the bulk of these impacts should be on future gas utility residential sales. Nevertheless, the Department welcomes detailed information and data from persons or organizations who believe that DOE has underestimated the likely impacts on gas utilities.

Also, two utilities suggested that results obtained for a region may differ greatly from results obtained for each separate utility system within a region. (Allegheny Power System (APS), No. 13, at 2; and, LSG, No. 11, at 6).

For the small gas furnace analysis, it was the Department's intention to capture as much of the regional variations as possible. LBL–REM used regional disaggregation in modeling space conditioning choice in new homes. While resource limitations prevented any further disaggregation of the marektplace, DOE is interested in receiving information and data on any specific regional problems that were overlooked.

Several gas distribution companies and gas suppliers, and the Southern Gas Association (SGA) and AGA endorsed the 71 percent AFUE furnace standard over the 78 percent AFUE. They cited various reasons for their preference for the lower efficiency, the predominant one being the impact on gas utilities of reduced load that would result from a 78 percent standard.[18] Comments in favor of the 78 percent AFUE were received from the Gas Appliance Manufacturers Association and the Edison Electric Institute. (GAMA, No. 23, at 1); (EEI, No. 20, at 2). Three comments encouraging a thorough analysis of all factors before a decision is made were submitted by the Natural Resources Defense Council, the New York State Energy Office, and the American Council for an Energy-Efficient Economy (ACEEE). (NRDC, No. 19, at 6–8; NYSEO, No. 32, at 7–8; ACEEE, Testimony).

Several comments favored DOE's approach of considering two standards cases, 71 percent and 78 percent, since efficiencies between 71 and 78 percent are not well-defined in terms of inherent design options. (PING, No. 3, at 3; Peo.G., No. 6, at 1; FNGA, No. 14, at 1; ENTEX, No. 15, at 2; AGA, No. 24, at 7; and SGA, No. 26, at 2).

Comments requesting consideration of a range of efficiencies between 71 and 78 percent were received from Southern Company Services Inc. (SCS). (SCS, No. 7, at 1).

While the Department still believes that 71 percent and 78 percent AFUE are the meaningful candidate levels, an analysis at 74 percent AFUE was also conducted.

The Edison Electric Institute suggested that the 78 percent AFUE level should be the base case or "default level" unless DOE justifies reducing it to 71 percent. (EEI, No. 20, at 3). The New York State Energy Office stated that DOE is required to investigate maximum technical feasibility efficiency levels for small furnaces and that while pulse combustion and heat exchangers are not on the list of design options to be examined, they should be. (NYSEO, No. 32, at 7–8).

The "max-tech" level of efficiency for small furnaces is 96 percent AFUE; therefore, it cannot be a candidate standard level for this rulemaking, because it falls outside of the range for consideration set by section 325(f)(1)(B)(ii) of the Act.

Only one comment addressed test procedure issues. York International (York) pointed out that "the measure of efficiency for furnaces under the FTC appliance labeling requirements is the annual fuel utilization efficiency (AFUE) and not the Energy Factor." (York, No. 1, at 1). The Act is explicit under the definition of "efficiency descriptor" stating "for furnaces and direct heating equipment, (it is) annual fuel utilization efficiency." Section 321 (a)(22)(A). The confusion in this matter has reference to section III of DOE's advance notice, in which outputs of the engineering analysis are listed as Energy Efficiency (expressed as the DOE energy factor) with a footnote stating "the energy factor is a measure of energy efficiency derived from the DOE test procedure for that product." The problem is that the DOE test procedure for furnaces includes an additional efficiency descriptor called Energy Factor which includes the electric energy in the calculation. This potential misinterpretation, that energy efficiency refers to the "Energy Factor," is being clarified by stating that energy efficiency refers to AFUE.

Maintenance Expense. Several gas companies referenced the need to consider higher maintenance expense for the 78 percent AFUE furnace standard. (A1G, No. 8, at 6; LSG, No. 11, at 4&8; FNGA, No. 14, at 4; VANG, No. 16, at 7; ALG, No. 26, at 2; and NG Co., No. 37, at 2). Since this efficiency level would require the use of a fan motor and its associated controls for induced draft, the maintenance expense was included in the Engineering Analysis.

Higher First Costs/Installation Costs. Several of the gas companies and associations cited increased installation expenses due to special venting requirements as being necessary to consider in the engineering and economic analyses for the 78 percent AFUE standard for induced draft type furnaces. (OKNG, No. 2, at 2; ETNG, No. 9, at 4 and 5; LSG; No. 11, at 8; ANR, No. 12, at 2; FNGA, No. 14, at 2; VANG, No. 16, at 5; AGA, No. 24, at 12; SGA, No. 25, at 4; UCG, No. 27, at 3; SCE&G, No. 28, at 3; and NG Co., No. 37, at 2). Generally, these comments addressed problems that would arise when a furnace and a water heater are installed with a common vent system.

Name	Assigned Abbreviation	Comment No.
Oklahoma Natural Gas Co	OKNG	2.
Piedmont Natural Gas Co., Inc	PING	3.
Public Service Co. of N.C. Inc	Pub.S.	5.
Peoples Gas System Inc	Peo.G.	6.
Southern Companies Services Inc.	SCS	7.
Alabama Gas Corp	AIG	8.
East Tennessee Natural Gas Co.	ETNG	9.
Lone Star Gas Co	LSG	11.
ANR Pipeline Co	ANR	12 and 34.
Florida Natural Gas Association Energy Committee.	FNGA	14.
Entex	ENTEX	15.
Virginia Natural Gas Inc	VANG	16.
Gas Appliance Manufacturers Association.	GAMA	23.
The American Gas Association	AGA	24.
Southern Gas Association	SGA	25.
Arkansas Louisiana Gas Co	ALG	26.
United Cities Gas Co	UCG	27.
South Carolina Electric & Gas Co.	SCE and G	28.
Sierra Power Co	SP Co.	30.
Northern Illinois Gas	NIGas	36.
Nashville Gas Co	NG Co.	37.

[18] The gas utility companies and associations responding included:

These additional expenditures were cited as needed since a separate vent may be required to vent an induced draft type furnace. Also, the existing vent used for the water heater would then be oversized and possibly require a revised water heater vent or insulation of the vent to prevent condensation. Particular problems were cited for multifamily structures and accessibility to the existing venting for retrofit. GAMA disagreed, stating that venting of induced draft gas furnaces in multifamily housing would cost less, not more, than the atmospheric type of vent systems. (GAMA, No. 23, at 4). GAMA also encouraged DOE to examine further this comparative cost issue. This issue had not been addressed explicitly by LBL and additional analysis is planned before DOE will issue a final rule.

Regional Analysis. Several gas companies and their associations submitted comments suggesting that a regional analysis be included that accounts for the reduced heat load and energy savings that would prevail for the higher efficiency, i.e., 78 percent AFUE, in milder climates. (PING, No. 3, at 2; Peo.G., No. 6, at 2; A1G, No. 8, at 3&7; FNGA, No. 14, at 4; AGA, No. 24, at 14; SGA, No. 26, at 2; and SCE&G, No. 28, at 2).

A national estimate was made using LBL–REM. DOE recognizes that there are regional differences in climate. LBL–REM includes a heat load calculation for new houses in each state that is used for projecting market shares of small gas furnaces. The average unit energy consumption of small gas furnaces reflects the average climate where small gas furnaces are located, not a national population-based climate.

In addition, DOE performed a sensitivity analysis on the LCC analysis using regional energy prices and usage rates. *See Technical Support Document,* section 6.2. Because of the impact that usage and prices can have on the results, DOE requests comments on this issue.

Vent Installation—Ability to Use Common Venting. Many of the gas companies and their associations contended that a major issue to be considered in the 78 percent AFUE furnace (an induced draft type system) are code requirements which would prohibit the installation of this type furnace in a common vent with an atmospheric type burner system. This would be particularly important in the replacement market. (PING, No. 3, at 3; OKNG, No. 2, at 2; Peo.G, No. 6, at 2; A1G, No. 8, at 4; FNGA, No. 14, at 3; VANG, No. 16, at 7; SGA, No. 25, at 3; ALG, No. 26, at 2; NIGAS, No. 36, at 2).

The National Fuel Gas Code (ANSI Standard Z223.1), which is the major installation code for gas-fueled furnaces, addresses mechanical draft systems as follows: "Vent connection serving equipment vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure." This would prohibit an installation of a gas water heater and a gas furnace in a common chimney venting arrangement. The operative words in the code are "systems operating under positive pressure."

GAMA stated that "over 90 percent of the non-condensing induced draft furnaces and boilers certified by the American Gas Association can be safely common vented with conventional atmospheric type gas appliances." (GAMA, No. 23, at 3). GAMA cited a September 1985 "White Paper" prepared by the American Gas Association Laboratories, entitled "Common Vent Study of Power and Non Power Vented Appliances," to substantiate its statement and which GAMA believes directly contradicts the testimony of AGA and SGA. GAMA also submitted a list of engineering reports published by the AGA Laboratories in the July 1987 issue of the AGA Laboratories Directory of Certified Appliances. GAMA stated that the purpose of these reports is to identify specific induced draft non-condensing furnaces that can be common vented with conventional combustion system equipment. GAMA further stated that AGA's White Paper concluded that before allowing common venting of fan or blown assisted combustion system appliances with draft hood equipped appliances, code authorities are requiring engineering data to show satisfactory performance.

Based on this information, DOE believes that draft induced appliances can be used safely in a common vent system with atmospheric type (draft hood equipped) water heaters. However, there remains a question of the degree of acceptability by local code officials of draft-induced furnaces using a common vent with an atmospheric type water heater. DOE will examine these issues before issuing a final rule for the small furnace standard. DOE invites comments on these issues, especially with respect to the acceptance within each State or local jurisdiction regarding the special testing requirements and AGA engineering reports that are being used.

Several Comments also suggested that a variety of housing types and climates be investigated. SCE&G cited the need for specialized cases to examine payback and economic analysis for mild climates, such as those with less than 2500 degree days (SCE&G, No. 28, at 2).

Utility Impact Analysis—Fuel Switching Impact. Several gas utility companies commented that the utility analysis should include costs of all utilities, not only electric utilities. (OKNG, No. 2, at 3; Peo.G, No. 6, at 2; SCS, No. 7, at 1; A1G, No. 8, at 3 and 7; ETNG, No. 9, at 6; ANR, No. 12, at 3; FNGA, No. 14, at 3 and 4; ENTEX, No. 15, at 2; VANG, No. 16, at 6; ALG, No. 18, at 2; AGA, No. 24, at 4–7 and 12; SGA, No. 25, at 3; UCG, No. 27, at 4; SCE&G, No. 28, at 3; NIGAS, No. 36, at 2; and NGCo., No. 37, at 2).

These companies believe that probable shifts of gas utility load to electricity generation should be included in the analysis when considering the higher 78 percent AFUE levels for small gas furnaces. For example, gas utilities could suffer a decreased market share resulting in an increased cost of gas per unit sold. (LSG, No. 11, at 6). Several of these companies also pointed out that when load is lost to electric resistance heat—particularly baseboard radiant heat—that future conversion to gas would be cost prohibitive. Gas utilities also contended that a switch to electric resistance heat with its attendant higher cost of operation will hurt the elderly and lower income customers. AGA stated that the proposed methodology should not consider load loss to heat pumps in assessing the potential load loss from gas utilities when evaluating the shift of gas heating to electric resistance heat, as required by the Act. (AGA, No. 24, at 4).

In considering candidate standard levels, the Department will calculate the potential load loss of gas utilities to electric resistance heat, and to other heating choices, e.g., heat pumps.

The South Carolina Electric Company (SCE&G), which supplies both gas and electricity to its customers, favors the lower 71 percent AFUE standard for small furnaces. SCE&G stated that fuel switching will produce a greater demand for electricity on the company's electric system, but this will not cause a corresponding increase in KWh sales because of the utility's climate area. (SCE&G, No. 28, at 3).

Alabama Gas Corp. (A1G, No. 8, at 4) stated what many other gas utility companies also implied—that when a gas furnace is not selected, a gas water heater often will not be selected. Specific comments that cited statistics or estimates included the following: "Seventy-eight percent AFUE would lose 20–25 percent of the market to electric resistance"—(OKNG, No. 2, at

3); "forty percent of new homes in Florida install electric resistance heat," (FNGA, No. 14, at 3); "although less than 10 percent of dwelling units priced above $120,000 use electric resistance heat, roughly one-third of the units priced less than $60,000 use electric resistance heat. AGA projections of load loss to gas utilities between the years 1993 and 2000 could be as high as 600 BCF if the 78 percent AFUE level is prescribed." (NG Co., No. 37, at 3).

Conversely, EEI stated that DOE's analysis should consider only those households that are both candidates to purchase gas furnaces and candidates to purchase gas supply, since the decision of a builder to choose electric space conditioning may be based on the availability, cost or convenience of electricity and gas. EEI also commented that DOE should modify the utility analysis to include the benefits that will occur from improved gas energy efficiency causing an extension of future gas reserves. (EEI, No. 20, at 5). While improvement in energy efficiency in small gas furnaces would seem to extend future gas reserves, the Department believes that the private individuals' values for those reserves, as expressed in the marketplace, captures fully the benefits to society of any extension of the reserves' lifetimes. Therefore, no additional benefits to society will be calculated for this potential effect.

Sierra Pacific Power (SPC) stated that the analysis should also include gas utilities which would be impacted by: Reduction in fossil fuel usage; input to environmental assessment; change in investment; change in revenue requirements; change in facilities, and change in residential load factors. (SPC, No. 33, at 1).

NRDC contended that the furnace standard analysis should consider the likelihood of the Department's implementation of ASHRAE Special Project 53, which would require greater thermal integrity in homes that are heated by electric resistance heat than for those that are heated by gas. The contention was that since this would raise the first-cost of electric resistance heating relative to gas heating, it would "reduce or eliminate fuel switching to electric resistance resulting from furnace standards by reducing the differential costs—both first cost and operating cost—of gas and electric resistance houses." (NRDC, No. 19, at 8–9).

The Department accepts this point; however, DOE has no authority to implement a mandatory program, incorporating provisions of ASHRAE Special Project 53, that would apply to non-Federal construction.

NRDC also suggested that consideration of the small gas furnace standard be done in the context of manufacturers having retooled to meet a 78 percent AFUE standard for gas furnaces greater than 45,000 Btu. Therefore, to produce a 71 percent AFUE unit would require setting up a separate production line which, because of the relatively small numbers of small furnaces produced, could result in higher unit cost than would a 78 percent standard for small furnaces. (NRDC, No. 19, at 6).

The Department's analysis evaluated the impacts of standards on small gas furnaces in the context of a 78 percent standard in effect on all furnaces greater than 45,00 Btu/hour input.

The NRDC contended, in advocating a 78 percent AFUE small gas furnace standard, that those consumers who are already willing and institutionally able to trade off higher first costs in return for lower operating costs will buy a small gas furnace, even at 71 percent efficiency. NRDC maintained,

> It would seem anomalous if a family that was willing to accept, say, a five-year payback on going from resistance heat to gas would not be willing to accept a similar or shorter payback with respect to increasing the efficiency of the gas furnace. We believe the model should reflect this syllogism. (NRDC, No. 19, at 7).

This comment contains implicit assumptions that are not necessarily valid. The payback on the higher efficiency furnace would be similar or shorter only if it had a less than proportional price increase to reach the higher efficiency. If the price increase for the higher efficiency unit were proportionately more expensive than the value of additional energy saved, then the payback period would, in fact, be longer.

The American Council for an Energy-Efficient Economy testified that claims about shifts in markets should be avoided unless supported by empirical evidence. (ACEEE, Testimony).

Future Market. Several gas utilities and associations commented that the future market for gas furnaces of less than 45,000 Btu/h input is considerably greater than may be projected by the LBL–REM. (A1G, No. 8, at 3–5; VANG, No. 16, at 6; AGA, No. 24, at 9, 11, and 15; SGA, No. 25, at 3; and ANR, No. 34, at 2).

The major reasons given to support this assertion were: Thermal integrity of buildings is improving due to either retrofit or to recent changes in model building codes; historical oversizing of gas furnaces has now been recognized and oversizing practices are being moderated (in some cases as a result of building codes); and, there are increased numbers of multifamily housing units with their smaller sizes and lower heating requirements. AGA provided data from its Space Heating Efficiency Improvement Program (SHEIP) showing that furnaces are typically 2½ times oversized, and all new and existing multifamily units could be served by less than 45,000 Btu/h furnaces. (AGA, No. 24, at 10).

AGA also commented that the assumption in the proposed methodology that the market for a small gas furnace is the single family house which is undefined by size, heat loss, geographic region, or socioeconomic group is questionable for existing construction, and is an incorrect assumption for new housing built from 1992 and beyond. (AGA, No. 24, at 9).

"AGA statistics indicate that average gas consumption for house heating customers declined 27.4 percent from 1973 baseline consumption levels, while the number of house heating customers increased 17 percent." AGA also comments that master meter prohibitions and rehabilitation of existing buildings are greatly expanding the market for the small gas furnace. (AGA, No. 24, at 10).

Impact of Builder and Developer Decisions. Several of the gas utility companies and their associations stated that DOE's methodology should evaluate builder decision-making regarding type of heating fuel selected. (PING, No. 3, at 3; OKNG, No. 5, at 2; A1G, No. 8, at 4 and 6; FNGA, No. 14, at 2; ENTEX, No. 15, at 2; VANG, No. 2, at 4 and 5; AGA, No. 24, at 11 and 12; SGA, No. 25, at 6; UCG, No. 27, at 3; and ANR, Nos. 12 and 34, at 3). ANR cited an opinion survey that concluded that builders are the decision-makers in selecting a heating system for single family residences. The objective of these comments was to show that builders' decisions were based on first cost, and that builders will switch to electric resistance because of the increased cost for the 78 percent AFUE furnace. (ANR, No. 34, at 3). NRDC contends that no further switch to electric is likely as a result of the small gas furnace standard going from 71 to 78 percent AFUE, since first cost is already significant for gas at 71 percent versus electric. EEI stated that if a builder decides not to purchase gas it may be for reasons other than whether the furnace is 71 percent or 78 percent AFUE, namely, reasons such as individual metering requirements, interruptible rate requirements, etc. (EEI, No. 20, at 5). Florida Natural Gas has stated that 40 percent of new homes in Florida are presently installed with

electric resistance heat. (FNGA, No. 14, at 3).

Comments on future market share have an overlapping consequence to this analysis if the future market share for small gas furnaces is as great as some have predicted. As a result of more thermally efficient homes, and, with less oversizing of furnaces, the principal market share that otherwise would have been 78 percent AFUE (the NAECA standard for furnaces greater than 45,000 Btu/h) would become 71 percent AFUE if the smaller furnace is predominant. One basis of setting standards for furnaces was predicated on the fact that builders determine the type of equipment to be installed and do so on first cost. If the 71 percent AFUE furnace is available, and attains a large share of the future market for small gas furnaces, the less efficient furnace may be used in structures where a greater than 45,000 Btu/h furnace (of 78 percent AFUE) would otherwise have been used.

In other words, the purpose of an energy efficiency standard as specified by the Act for the typical gas furnace at 78 percent AFUE would be circumvented by the availability to the builder market of a 71 percent AFUE furnace at lower cost. The more thermally efficient home, coupled with less oversizing, could lead to more small gas furnaces. The builder model that would otherwise have been a somewhat larger than 45,000 Btu/h, 78 percent AFUE furnace could become the less expensive 45,000 Btu/h, 71 percent furnace, in a structure that, because of improved construction (with lower heat loss), could then use the smaller furnace.

4. Efficiency Levels Analyzed

Table 3.4 presents the efficiency levels selected for analysis for 1992. Alternate levels were selected to generate a range of impacts for analysis. The initial level selected, level 3, corresponds to the highest efficiency level provided for in the Act. Standards above 78 percent AFUE were excluded from consideration because the Act specifies that such a standard may not be greater than 78 percent AFUE. Levels 1 and 2 correspond to efficiencies lower than level 3, with level 1 being the lowest level provided for in the Act. Levels 1 and 2 were analyzed discretely in the Engineering Analysis. Level 3, 78 percent AFUE, was based on engineering level 3, having an intermittent ignition device and induced draft. In addition, the engineering analysis considered design options that would result in furnace efficiencies as great as 92 percent AFUE. These more efficient designs, as mentioned above, were not considered for potential standards, but rather were used as input to the LBL–REM in order that the energy forecasting analysis would have a complete set of data upon which to make projections.

TABLE 3–4. STANDARD LEVELS ANALYZED FOR SMALL GAS FURNACES

Standard level	AFUE (percent)
1	71
2	74
3	78

Payback Period. Table 3.5 presents the payback period for the efficiency levels analyzed. For both classes, level 1 is the only energy conservation standard level in which the additional cost of purchasing a product at this efficiency level will be less than three times the value of the energy savings the consumer will receive during the first year. The payback period for units that meet level 1 efficiency ranges from 2.3 years for a warm air indoor gas furnace to 2.5 years for a warm air outdoor gas furnace. *See* Technical Support Document Tables 3.41 and 3.42.

TABLE 3–5. PAYBACK PERIODS OF DESIGN OPTIONS YEARS FOR GAS FURNACES (LESS THAN 45,000 BTU/HR.)

Standard level	Payback periods	
	Warm air indoor	Warm air outdoor
1	2.3	2.5
2	14.4	15.6
3	5.1	6.4

Significance of Energy Savings. By the year 2015, the weighted average energy efficiency of new small gas furnaces sold in the absence of standards is projected to be 80.3 percent AFUE. Standards, at standard levels 1 and 3, are expected to increase the average shipment weighted efficiency of small gas furnaces to between 81.6 and 84.3 percent AFUE, respectively. *See* Technical Support Document, Table 5.16. However, the aggregate annual energy consumption of small gas furnaces is projected to increase slightly. This increase in gas consumption for small gas furnaces comes at the expense of larger gas furnaces, heat pumps, and central electrical furnaces. *See* Technical Support Document, Table 5.18. While standards increase the efficiency and cost of small gas furnaces, the market for small furnaces is projected to increase at the same time. When energy conservation standards are imposed, the LBL–REM projects that over the period 1992–2015, the following increase in energy consumption of small gas furnaces would occur:

Level 1—0.01 Quads
Level 2—0.03 Quads
Level 3—0.05 Quads

Economic Justification—A. *Economic Impact on Manufacturers and Consumers.* The per unit increased cost to manufacturers to meet the level 3 efficiency ranges from $64 for an indoor gas furnace to $88 for an outdoor gas furnace. *See* Technical Support Document, Tables 3.24 and 3.25.

At that level of efficiency, the price to the consumer increases $215.10 for indoor gas furnaces and $257.60 for outdoor gas furnaces at level 3. *See* Technical Support Document, Tables 3.41 and 3.42.

The LBL–REM results indicate that standards at level 3 will result in nearly a five percent improvement in average shipment weighted efficiency when compared to standard level 1. This would result in a negligible drop in life cycle costs. *See* Technical Support Document, Table 5.16 and Figures 3.11 and 3.12.

In the LBL–MIM results for small gas furnaces, it was found that standards would cause manufacturers to lose even more money on these furnaces than they are projected to lose in the base or no-standards case. In the base case, manufacturers' returns on equity (ROE) are expected to be −2.02 percent for small furnaces, compared to a base case ROE of a −2.13 percent under standard level 3.

Small gas furnaces tend to have very low profit margins and thus they contribute little or nothing to a gas furnace manufacturer's profitability. DOE believes this is because of marketing considerations, in that manufacturers find it important for marketing purposes to carry a complete line of furnace capacities. Thus, manufacturers tend to carry small gas furnaces in their product lines, although many of these firms carry only one or two models.

LBL–MIM projects that a standard of either 71, 74, or 78 percent AFUE for small gas furnaces would result in slightly fewer shipments, higher product prices, and lower net income and ROE than would occur in the absence of standards.

The LBL–MIM predicts at level 3 that a prototypical furnace manufacturer would experience a .001 percent decrease in ROE. *See* Technical Support Document, Table 7.23. The sensitivity analysis, however, indicates the gas

furnace industry results are sensitive to consumer price elasticities and unit variable cost increases. For example, the sensitivity analysis indicates that the effects of standards could be to decrease return-on-equity for small gas furnace manufacturers by nearly 1.2 percent or to raise it by nearly the same amount. However, there is only a one percent chance of either of these sensitivity results occurring. *See* Technical Support Document, Table 7.25.

B. *Life Cycle Cost and Net Present Value.* The LCC analysis indicates that at each possible standard level the increase in purchase price would be offset by savings in operating expenses. *See* Technical Support Document, Tables 3.41 and 3.42. Also, of the three candidate standard levels, level 3 had the lowest consumer life-cycle cost. This indicates that the standard level would not cause any economic burden on the average consumer because of the decreasing life cycle costs.

The NPV analysis indicates that if a standard were adopted at level 3, there would be a net present value of a negative $17 million to consumers. This negative value is due principally to the increase in furnace shipments and a corresponding increase in total gas consumption in the standards cases. *See* Technical Support Document, Table 5.37.

C. *Energy Savings.* As indicated above, standards will result in an increase of gas consumption for small gas furnaces. If, however, the marketplace continues to demand changes in efficiency at the same rate as historically, the LBL–REM projects that there would be no savings from standards over the 1992–2015 period. This result occurs because in the base case, the efficiency or SWEF of all new small gas furnaces is projected to exceed the 78 percent AFUE standard by the time it would come into effect. *See* Technical Support Document, Table 5.30, Reference 10.

D. *Lessening of Utility or Performance of Products.* As indicated above, DOE established classes of products in order to assure that the standards analyzed would not lessen the existing utility for performance of small gas furnaces.

E. *Impact of Lessening Competition.* The determination of this factor must be made by the Attorney General.

F. *Need to Save Energy.* Small gas furnaces use natural gas as their energy source. Nearly seven percent of the nation's natural gas consumption is used to operate small gas furnaces, and nearly five percent of that seven percent would be saved by standards for this product at level 3. However, the sensitivity analysis on the LBL–REM indicates that if consumer awareness of and concern with appliance efficiency continues the projected savings would be the same as with level 3 standards.

Conclusion. The Department is proposing a 78 percent AFUE standard on small gas furnaces. A 78 percent AFUE standard for small gas furnaces would result in a significant conservation of energy, and although the payback is greater than three years, the standard level was found to be economically justified.

In addition to producing the maximum unit energy savings of the candidate standards, this standard is beneficial to consumers and manufacturers alike.

For consumers, the 78 percent AFUE standard produces the lowest consumer life-cycle cost of the candidate levels. In addition, the initial purchase price increase may be lower than that which has been estimated. This result is possible because the 78 percent AFUE standard on small gas furnaces is the same level of efficiency that the Act imposes on larger gas furnaces, which presently comprise more than 95 percent of furnance sales. Therefore, to the extent that manufacturers can produce these small units on the same production lines, with the same design options that will be used for the larger furnaces, there may be economics of scale in the production of these units.

Small gas furnace manufacturers have strongly supported the 78 percent AFUE standard on their products. The analysis indicates that such a standard should have relatively little economic impact on them. The uniformity of a 78 percent AFUE standard on small furnaces and on larger units may make the production process simpler for the manufacturers. This occurs because as mentioned above, a uniform standard for all gas furnaces could result in fewer production lines.

In comments on the advance notice, several gas utilities contended that a 78 percent AFUE standard on small gas furnaces would cause them to lose market share to electric utilities. This analysis, however, indicates that such a loss of market share is not a likely result from a 78 percent AFUE standard. The LBL–REM projects that market share for small gas furnaces is likely to increase as a result of the level 3 standard.

One small drawback to the 78 percent AFUE standard on small gas furnaces is that it would eliminate units that may be, in some circumstances, the most cost-effective for some consumers. This is a result that could possibly occur in some Southern-tier States, where the most cost-effective small gas furnace could be one that is less efficient and whose first cost is less than the minimum LCC unit. This less efficient unit could cost the consumer less to operate, on a LCC basis, if the usage rate is extremely low. With low usage it is possible that any increase in purchase price may not be matched by reductions in annual operating costs. Nevertheless, while this is a possible outcome for some purchasers in some areas, the Department believes that such effects, should they occur at all, would be limited.

c. Television Sets

1. Classes

In accordance with the Act, the Department is considering the establishment of an energy conservation standard for television sets, to become effective no earlier than January 1, 1992. The advance notice proposed two classes of television sets, color and monochrome (black and white) to be evaluated for separate levels of efficiency. DOE identified eight design options and requested data on power demand characteristics.

The two classes are distinguished by the ability of one to reproduce images in color, a performance-related feature that affects utility and efficiency.

Color television sets usually consume more energy than comparable monochrome television sets, because of the use of multiple electron guns. For this reason, energy efficiency levels achieved by monochrome television sets are not achievable in color television sets. Since color television sets and monochrome television sets offer distinct differences in utility to the consumer, DOE is specifying separate classes for color and monochrome television sets.

Certain features on television sets, such as remote control and stereo components, provide utility to the consumer and may affect energy consumption. Although such characteristics typically would require the establishment of separate classes for television sets with such features, the Department was unable to analyze these features separately and, hence, is not establishing separate classes for them.

2. Design Options

The following is a list of design options that were examined for both color and black and white television sets:

(A) Remote control.
(B) Electronic tuning.
(C) Automatic color control.
(D) Vertical interval reference.
(E) Brightness sensor.

(F) Voltage regulating power source.
(G) Display device.
(H) One-gun tube.

3. Comments on the Advance Notice of Proposed Rulemaking

Three comments addressed specifically the issue of standards for television sets; these were offered by one manufacturer, one manufacturers' association, and one conservation group. Thompson Consumer Electronics, Inc. (Thompson), manufacturer-marketing company for Radio Corporation of America (RCA) and General Electric (GE) brand television sets, opposed the establishment of energy standards for television sets. Thompson claimed that the technological advancement of solid state electronics in replacing tubes had extensively increased the energy efficiency of television sets. (Thompson, No. 4, at 2). The company stated further that its research revealed an incremental improvement of only 5–48 kilowatt hours (Kwh) per year based on the standard operating time of 2200 hours per year. (Thompson, No. 4, at 3). These claims were supported by the Consumer Electronics Group of the Electronic Industries Association (EIA), an industry trade association representing television manufacturers. (EIA, No. 21, at 2).

Additional comments contended that manufacturers prefer to decrease energy use because of the adverse effects on reliability and performance that can be caused by the excess heat generated by inefficient electronics. (Thompson, No. 4, at 3; and EIA, No. 21, at 3).

NRDC supported the establishment of standards for television sets and maintained that a significant conservation potential exists for this product. (NRDC, No. 19, at 3). NRDC suggested that the list of design options be left open to allow for new and cost-effective energy efficient technologies. One of those recommended was based on the observed variation in power requirement between a 40-inch color set of 190 watts and a four inch monochrome portable of 3.6 watts. It was suggested that even allowing for color versus black and white difference, the 10-fold decrease in size inferred some technology of portability which could be employed in larger sets. (NRDC, No. 19, at 4). DOE has reviewed this comment and does not find a basis for the improvement potential suggested by NRDC. Therefore, the Department rejects NRDC's inference of improvement potential.

NRDC expressed the expectation that the Department would issue a standard for television sets as long as at least one of the design options analyzed has a favorable life cycle cost and meets the other impact criteria under which DOE is operating. (NRDC, No. 19, at 5).

EIA submitted that television sets no longer use significant amounts of energy and are "covered products" because of historical data obtained when tubes were used primarily in the circuits. (EIA, No. 21, at 2). EIA also commented that television sets are not similar to any other covered product. In addition, EIA claimed that standards could retard development of new television set designs. Specifically, EIA stated that standards would cause manufacturers to reallocate funds presently being used to support research on high-definition television (HDTV), research that is being coordinated by the Federal Communications Commission. (EIA, No. 21, at 3).

EIA and Thompson discussed the eight proposed design options.

1. *Remote control* is seen as a consumer utility using five watts or less. Statistics were provided showing that 68 percent of color sets sold in 1987 included remote control (EIA, No. 21, at 4). It was also noted that not all remote controls have the same features, thereby affecting power requirements (Thompson, No. 4, at 6). Furthermore, EIA indicated that while manufacturers are moving toward use of more energy consumptive remote control devices, such devices will result in a more efficient television set in the playing mode. EIA did not provide a specific example of how this condition could occur. (EIA, No. 21, at 4).

2. *Electronic tuning* is considered to have negligible power requirements. (EIA, No. 4, at 6).

3. *Automatic color control* is described as a feature which does not use energy and is a component of the picture stabilization system. (Thompson, No. 4, at 6; and EIA, No. 21, at 5).

4. *Vertical Internal Reference* (VIR) is no longer in production according to these comments. (Thompson, No. 4, at 6; and EIA, No. 21, at 5).

5. *Brightness sensor* is seen as an energy saver by EIA, while Thompson points out that this device performs the same function available to the consumer using the picture controls. Both comments agree that this device uses no power. (EIA, No. 21, at 5; and Thompson, No. 4, at 6).

6. *Voltage regulating power source* contributes measurably to the energy consumption of television sets depending on the type of power supply. (Thompson, No. 4, at 7). It was noted by EIA that transformers have become obsolete with the advent of solid-state voltage regulators. The ability to increase the efficiency of the solid-state components shows little potential (EIA, No. 21, at 5).

7. *The cathode ray* tube is seen by Thompson and EIA as the only efficient and reliable display device known for use in direct view sets. (Thompson, No. 4 at 7; and EIA, No. 21, at 5). The concept of Liquid Crystal Display (LCD) is functional in small sets but very restrictive and unreliable in larger sets (EIA, No. 21, at 5).

8. *One-gun tube* color television sets have been demonstrated as a prototype; however, its enormous cost and poor quality picture have placed serious limitations on its commercial feasibility, according to EIA. (EIA, No. 21, at 6).

4. Efficiency Levels Analyzed

Table 3.6 presents the efficiency levels selected for analysis for 1992. Alternate levels were selected to generate a range of impacts for analysis. The initial level selected, level 3, corresponds to the highest efficiency level, i.e., the "max-tech" level, identified in the engineering analysis. It was felt that manufacturers could produce products at this efficiency, and that these products would not have any reliability problems. Level 2 corresponds to the minimum life-cycle cost point. Level 1 corresponds to efficiency lower than that of level 2. These levels were analyzed discretely in the Engineering Analysis.

TABLE 3–6.—Standard Levels Analyzed for Television Sets (KWH/YR.)

Standard level	Standard	
	Monochrome	Color
1	NA	Standby power no greater than 2 W/h
2	47	7.3 S + 38
3	45	6.9 S + 42

S is screen size (diagonal) in inches.

Note that standard level 1 is not a performance standard. DOE's measures of energy consumption by television sets are receiver energy efficiency factor and annual energy consumption, both annual energy use measures. Standby power deals with energy consumption of the unit for that period when the unit is not in operation. Section 321(a)(6)(A) of the Act prescribes that a performance standard "prescribes a minimum level of energy efficiency or a maximum quantity of energy use." DOE's analysis assumed that for level 1, the baseline unit was unchanged except for the standby power.

However, a limitation on standby power does not necessarily have an effect on the energy efficiency or energy

consumption as defined by DOE at § 430.22. While standby power may be limited, changes to the design of the television set can result in more energy being consumed when the unit is on, thereby resulting in more total energy being used.

Payback Period. Table 3–7 presents the payback period for the efficiency levels analyzed. For the color class, level 1 is the only energy conservation standard level in which the additional price of purchasing a product at this efficency level will be less than three times the value of the energy savings the consumer will receive during the first year. No standard level for monochrome televisions pays back in less than 3 years. The payback period for units that meet level 1 efficiency is approximately three years for the color class.

TABLE 3–7.—PAYBACK PERIODS (IN YEARS) FOR TWO CLASSES OF TELEVISION SETS

Standard level	Payback periods	
	19" to 20" color	13" to 14" monochrome
1	2.9	NA
2	3.4	4.7
3	3.7	11.6

By the year 2015 the weighted average energy consumption of new television sets sold in absence of standards is projected to decline nearly 20 percent, compared to new sets sold in 1987.

Significance of Energy Savings. With energy conservation standards imposed, the LBL–REM projects that over the period 1992–2015, the following savings would be attributable to standards:

Level 1—.66 Quads
Level 2—.69 Quads
Level 3—.73 Quads

See Technical Support Document, Table 5.28. On the basis of the above, DOE believes that the standards considered for television sets would result in a significant conservation of energy.

Economic Justification—A. *Economic Impact on Manufacturers and Consumers.* The per unit increased cost to manufacturers to meet the level 1 efficiency ranges from $0.33 for a 13-inch monochrome set to $2.15 for a 19–20 inch color set. *See* Technical Support Document, Tables 3.29 and 3.30.

The purchase price to the consumer increases $4.30 for the 19/20-inch color television set. *See* Technical Support Document, Table 3.43.

LBL–MIM projects that television standards would result in ROE essentially unchanged, compared to the base case of no-standards. *See* Technical Support Document, Table 7.27.

The sensitivity analysis also indicates that the television set industry's ROE is relatively insensitive to standards. DOE believes this results from the proportion of manufacturing costs due to standards that can be passed on to consumers in the form of a higher price and a low consumer demand elasticity with respect to price and operating cost.

B. *Life Cycle Cost and Net Present Value.* The LCC analysis indicates that for each possible standard level, except level 3, the increase in purchase price would be offset by savings in operating expenses. However, the LCC analysis indicates that for color television sets, the savings over the products' lifetimes would be slight and that for each standard level the savings are less than $5.00. *See* Technical Support Document, Figure 3.23. For 13 inch to 14 inch black and white televisions, the LCC savings over the expected lifetimes of the products are even slighter, as each candidate standard level would save less than $1.00. *See* Technical Support Document, Figure 3.24. This indicates that the standard level would not cause any economic burden on the average consumer.

The NPV analysis indicates that if a standard were adopted at level 1, 2, or 3, there would be a net present value of $1 billion from energy savings over the period 1992–2015. *See* Technical Support Document, Table 5.29.

C. *Energy Savings.* As indicated above, the maximum savings attributable to standards would be .73 Quads of electricity. This level would require the reduction of standby power and reduction of screen power, including a more efficient screen display.

D. *Lessening of Utility or Performance of Products.* As indicated above, DOE is required to establish classes of products in order to assure that the standards analyzed would not lessen the existing utility or performance of the regulated appliance. However, for television sets, the Department was not able to establish classes to assure the utility of the product. Almost every feature present on a television set that provides utility to the consumer, also affects the product's energy consumption. For example, remote control and stereo sound both provide utility to the consumer and affect energy consumption. Therefore, separate classes would have to be established for each feature, as well as for those products that have both features and those without either feature, a total of four classes, in order not to lessen the product's utility. However, because of the existence of a number of different features that provide utility but for which DOE has limited data on their energy consumption, the Department was not able to set separate classes for each. In addition, because the electronics industry is changing so rapidly, DOE believes that it is likely that future utility or performance would be lessened as a result of disincentives caused by standards to investments in energy-using new features.

E. *Impact of Lessening Competition.* The determination of this factor must be made by the Attorney General.

F. *Need to Save Energy.* Television sets use electricity as their energy source. Nearly one percent of the nation's electricity powers television sets, nearly 10 percent of that one percent would be saved by standards for this product at level 3. However, the sensitivity analysis on the LBL–REM indicates that if consumer awareness of, and concern with, appliance efficiency continues, the projected savings would be less than three percent of that one percent.

G. *Other Factors.* Television sets are presently not covered by the Federal Trade Commission (FTC) labeling program. Testing and certification could be an unusual burden on manufacturers of this product since testing and certification could result in delays in the rapid introduction of new technologies that characterize this industry. For example, a standard for television sets, involving the diversion of research and development monies to complying with the standard, could have an impact on the development of high resolution televisions, which is an effort that is presently being supported by the Federal Communications Commission (FCC).

Conclusion. After reviewing the effects that energy conservation standards on television sets would have, the Department is proposing a "no-standard" standard. The Department proposes that while energy conservation standards for television sets would save a significant amount of energy, they are not economically justified.

DOE believes standards for television sets would have insignificant impacts on consumer life-cycle costs, and could harm manufacturers, especially in their ability to introduce new products, i.e., by diverting research and development funds to complying with energy conservation standards. Any increase in cost to manufacturers due to efficiency testing and certification reporting will reduce the already small LCC savings. Furthermore, the Department is

concerned that standards could adversely impact the efforts to develop high resolution televisions, adversely affecting the future utility of the products.

For these costs, at standard level 3, the energy savings that the Nation would experience is approximately three-fourths of a Quad over 24 years, i.e., 1992–2015, which would result in minimal LCC savings, i.e., less than $5.00. The individual consumer would save only about one percent of his expected life-cycle costs.

Because of the relatively small impacts on energy consumption for television set consumer life-cycle costs, DOE believes that the manufacturer impacts described above are the most noteworthy.

Furthermore, because of limited available data on television sets, the standards analysis was unable to account for the wide variety of television features. Because of that, the Department believes that the establishment of energy conservation standards on television sets would restrict the utility and performance of new products.

Finally, as noted earlier, level 1 standard (standby power no greater than 2 watts per hour) was rejected from consideration because it does not meet either of the Department's two measures of television set energy consumption, namely, receiver energy efficiency factor and annual energy consumption. Standby power could be viewed as either a design standard or efficiency standard for a component. DOE views section 321(a)(6) of the Act as prohibiting standby power requirements for television sets.

Weighing the anticipated benefits against the potential costs, the Department is proposing that energy conservation standards for television sets, at each standard level considered, are not economically justified.

IV. Environmental, Regulatory Impact, Takings Assessment, Federalism and Regulatory Flexibility Reviews

The Department has reviewed today's proposed action in accordance with the Department's obligations under:

- The National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321 *et seq.*), the Council on Environmental Quality regulations implementing the procedural provisions of NEPA (40 CFR Part 1500 *et seq.*), and the Department's own NEPA regulations (10 CFR Part 1021);
- Executive Order 12291 (46 FR 13193, February 19, 1981) which pertains to agency review of the impact of Federal regulations; and
- Executive Order 12630 (53 FR 8859, March 18, 1988) which pertains to agency consideration of Federal actions that interfere with constitutionally protected property rights.
- Executive Order 12612 (52 FR 41685, October 30, 1987) which pertains to agency consideration of Federal actions that would have a substantial direct effect on States, on the relationship between the National Government and the States, and on the distribution of power and responsibilities among the various levels of government.
- The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) which requires, in part, that an agency prepare an initial regulatory flexibility analysis for any proposed rule unless it determines that the rule will not have a "significant economic impact on a substantial number of small entities." In the event that such an analysis is not required for a particular rule, the agency must publish a certification and explanation of that determination in the Federal Register.

a. Environmental Review

DOE prepared an Environmental Assessment (EA) on the proposed standards pursuant to the National Environmental Policy Act of 1969, as amended, Pub. L. 91–190, 40 U.S.C. 4221 *et seq.*, and the implementing regulations of the Council on Environmental Quality (40 CFR Parts 1500 through 1808). The EA addresses the possible incremental environmental effects attributable to the application of the proposed standards to the design of three types of covered products: refrigerators, refrigerator-freezers, and freezers; small gas furnaces; and television sets.

A Finding of No Significant Impact (FONSI) is published in today's Federal Register. The FONSI concludes that the proposed standards would result in no significant environmental impacts and that an environmental impact statement is not required.

The EA is part of the Technical Support Document and is available at the DOE Freedom of Information Reading Room at the address provided at the beginning of this notice.

b. Regulatory Impact Review

Executive Order 12291 (46 FR 13193, February 19, 1981) directs that, in proposing a major rule,[19] an agency perform a regulatory analysis. Such an analysis presents major alternatives to the regulation that could substantially achieve the same regulatory goal at lower cost, as well as a description of the costs and benefits (including potential net benefits) of the proposed rule.

DOE has determined that this proposed rule is a "major rule." Accordingly, a Draft Regulatory Impact Review has been prepared.

The Regulatory Analysis is summarized below. This summary focuses on the major alternatives considered in arriving at the proposed approach to improving the energy efficiency of consumer products. The reader is referred to the complete draft "Regulatory Impact Analysis," which will be available for public comment as indicated at the beginning of this notice. It consists of: (1) A statement of the problem addressed by this regulation, and the mandate for government action; (2) a description and analysis of the feasible policy alternatives to this regulation; (3) a quantitative comparison of the impacts of the alternatives; and (4) the economic impact of the proposed standard.

It should be noted at the outset that none of the alternatives for refrigerators and small gas furnaces that were examined saved as much energy as the proposed rule. Also, most of the alternatives would require that enabling legislation be enacted, since authority to carry out those alternatives does not presently exist.

Alternatives for Achieving Consumer Product Energy Conservation

Six major alternatives were identified by DOE as representing feasible policy alternatives for achieving consumer product energy efficiency. These alternatives include:

- No New Regulatory Action.
- Informational Action:
  - —Product labeling.
  - —Consumer education.
- Prescriptive Standards.
- Financial Incentives:
  - —Tax credits.
  - —Rebates.
- Voluntary Energy Efficiency Targets.
- The Proposed Approach (Performance Standards).

Each alternative has been evaluated in terms of its ability to achieve significant energy savings at reasonable

[19] "Major rule" means any regulation that is likely to result in: (1) An annual effect on the economy of $100 million or more; (2) A major increase in costs or prices for consumers, individual industries, Federal, State, or local government agencies, or geographic regions; or (3) Significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises in domestic or export markets.

costs, and has been compared to the effectiveness of the proposed regulation.

If no new regulatory action were taken, then no new standards would be implemented for refrigerators, small gas furnaces, or television sets. This is essentially the "base case" for each appliance. In this case, between the years 1992 and 2015 there would be expected energy use of 46.94 Quads of primary energy, with no energy savings and a zero net present value.

Several alternatives to the base case can be grouped under the heading of informational action. They include consumer product labeling and DOE's public education and information program. Both of these alternatives are mandated by the Act. One base case alternative would be to estimate the energy conservation potential of enhancing these programs. To model this possibility, the Department assumed that market discount rates would be lowered by five percent for refrigerators and by two percent for purchasers of small gas furnaces. This resulted in no energy savings, with expected consumption equal to that of the base case.

Another method of setting standards would entail requiring that certain design options be used on each product, i.e., prescriptive standards. For refrigerators, this involved assuming a 1.5 inch foam door and 5.0 EER compressor, and, for small gas furnaces, a power burner. This resulted in energy consumption, between 1992 and 2015, of 43.14 Quads, and savings of 3.8 Quads. The net present value, in 1987 dollars, was $8.52 billion.

Various financial incentive alternatives were tested. These included tax credits and rebates to consumers, as well as tax credits to manufacturers. The tax credits to consumers were assumed to be 15 percent of the increased cost of higher energy efficiency features of these appliances, while the rebates were assumed to be 15 percent of the increase in equipment prices. The tax credits to consumers showed almost no change from the base case, i.e., this alternative would save less than .01 Quad with a net present value of $20 million. Consumer rebates however, would save .04 Quad with a net present value of $210 million.

The consumer rebate program and the tax credit program would return to the participating consumer exactly the same amount of money. However, it is expected that there will be more participants in the rebate program. Therefore, the rebate program would result in substantially more energy savings than the tax credit program would.

The most important difference to the consumer between rebate and tax credit programs is that a rebate can be obtained quickly, whereas a tax credit is delayed until income taxes are filed or a tax refund is provided by the Internal Revenue Service. This means that middle and low income purchasers, who generally have little ready cash to purchase more expensive products, are not so likely to take advantage of the program as are upper income purchasers. To simulate this impact, DOE has assumed that only 60 percent of consumers would purchase more energy efficient products as a result of the tax credit program.

Another financial incentive that was considered was tax credits to manufacturers for the production of energy-efficient refrigerators and small gas furnaces. In this scenario, an investment tax credit (ITC) of 20 percent was assumed. The tax credits to manufacturers had almost no effect, since the energy consumption estimates are 46.93 Quads with savings equal to .01 Quad, and a net present value equal to zero.

The impact of this scenario is so small because the ITC was applicable only to the tooling and machinery costs of the firms, i.e., the firms' fixed costs, and most of the design improvements that would likely be adopted to manufacture more efficient refrigerator and small gas furnaces would involve purchased parts. Expenses for purchased parts would not be eligible for an ITC.

Two scenarios of voluntary energy efficiency targets were examined; in the first one, the proposed energy conservation standards were assumed to be voluntarily adopted by all the relevant manufacturers in five years, and, in the second scenario, the proposed standards were assumed to be adopted in 10 years. In these scenarios, the five year delay would result in energy consumption by these appliances of 43.01 Quads, energy savings of 3.93 Quads, and a net present value of $8.41 billion; the 10 year delay would result in 44.75 Quads of energy being consumed, 2.19 Quads being saved, and a net present value of $5.47 billion.

These scenarios assume that there would be universal voluntary adoption of the energy conservation standards by the refrigerator and small gas furnace manufacturers, an assumption for which there is no reasonable assurance.

Lastly, all of these alternatives must be gauged against the performance standards that are being proposed in this notice. Such performance standards would result in energy consumption of refrigerators, small gas furnaces, and television sets to total an estimated 41.01 Quads of primary energy over the 1992–2015 time period. Savings would be 5.93 Quads, and the net present value would be an expected $12.23 billion.

As noted at the beginning of this section, none of the alternatives that were considered for refrigerators and small gas furnaces would save as much energy as the proposed rule.

c. "Takings" Assessment Review

Executive Order 12630 (53 FR 8859, March 18, 1988) directs that, in proposing a regulation, an agency conduct a "takings" review. Such a review is intended to assist agencies in avoiding unnecessary takings and help such agencies account for those takings that are necessitated by statutory mandate.

For purposes of the Order:

"Policies that have takings implications" refers to Federal regulations, proposed Federal regulations, proposed Federal legislation, comments on proposed Federal legislation, or other Federal policy statements that, if implemented or enacted, could effect a taking, such as rules and regulations that propose or implement licensing, permitting, or other condition requirements or limitations on private property use, or that require dedications or exactions from owners of private property.

It appears that there are three parts of the appliance standards program that could conceivably be viewed as having "takings implications." These are testing and certification requirements, the impacts of standard levels, and possible DOE testing of products for validation.

With regard to the first part, namely, testing and certification, the Department believes that such a requirement, implementing a long-established statutory mandate in a manner calculated to minimize adverse economic impacts does not constitute a "taking" of private property.

Similarly, the Department's possible validation testing does not constitute a "taking," within the limitations described above.

Lastly, the impact of standards could be viewed by some as a "taking." Nevertheless, the Department believes that the fact that while an energy conservation standard may limit some manufacturers in the range of appliance efficiencies that they can produce, such narrowing of the energy efficiency range does not constitute a "taking" in the sense described above.

In short, in none of the three parts of the appliance standards program does the Department believe that the provisions of E.O.12630 pertain.

d. Federalism Review

Executive Order 12612 (52 FR 41685, October 30, 1987) requires that regulations or rules be reviewed for any substantial direct effects on States, on the relationship between the National Government and the States, or on the distribution of power and responsibilities among various levels of government. If there are sufficient substantial direct effects, then Executive Order 12612 requires preparation of a federalism assessment to be used in all decisions involved in promulgating and implementing a regulation or a rule.

DOE has identified a substantial direct effect that today's regulation, when finalized, would have on State governments. It would initially preempt inconsistent State regulations. However, DOE has concluded that the initially preemptive effect is not sufficient to warrant preparation of a federalism assessment for two reasons. First, DOE does not have discretion under the Act to avoid promulgating a preemptive regulation because of a policy preference for State regulation as a general matter. Second, the Act provides for subsequent State petitions for exemption which necessarily means that the determination as to whether a State law prevails must be made on a case-by-case basis using criteria set forth in the Act. When DOE receives such a petition, it will be appropriate to consider preparing a federalism assessment consistent with the criteria in the Act.

e. Regulatory Flexibility Review

The Regulatory Flexibility Act of 1980 (Pub. L. 96–354) requires an assessment of the impact of proposed regulations on small businesses. Small businesses are defined as those firms within an industry that are privately owned and less dominant in the market.

In this rulemaking, three different products and, hence, industries, are being addressed. Regulatory flexibility for the television set industry, however, does not need to be considered since this notice is proposing no energy conservation standards on those manufacturers. Regulatory flexibility issues will be addressed for the two industries for which standards are being proposed.

First, the energy conservation standard of 78 percent AFUE on those small gas furnace manufacturers, who could be considered small businesses, will be discussed. There is no indication that the impact of standards will be directly related to firm size. Although different size firms have different cost structures, industry sources indicate that, overall, neither large nor small firms have a cost advantage and that neither large nor small firms tend to have a higher proportion of fixed cost. A corollary to this observation is that profits are also not correlated to firm size. Some large firms are quite profitable, others earn normal profits, while others are marginally profitable, and the same is true for smaller firms.

The Engineering Analysis indicates that the measures necessary to meet the standards levels under consideration involve using additional purchased parts. While larger firms may have some slight cost advantage from buying in larger quantities, the fact that the design options predominantly involve purchased parts tends to be an equalizing factor among different-sized firms.

Therefore, the fact that this energy conservation standard on small gas furnaces is not likely to "have a significant economic impact on a substantial number of small entities" suggests that the provisions of section 605(b) of the Regulatory Flexibility Act pertain. These provisions state that neither an initial nor a final regulatory flexibility analysis need be performed for a proposed or final rule "if the head of the agency certifies that the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities."

Secondly, the proposed energy conservation standards on refrigerator manufacturers needs to be addressed. It is not at all clear that the standard levels being proposed will "have a significant economic impact on a substantial number of small firms." The LBL–MIM indicates through its predictions of an increase in typical ROE that standards are likely to slow down the consolidation process temporarily. This would lead to a temporary slowing down of the continuing decrease in this industry's competitiveness. However this prediction would be tempered by the observation that if standards were technologically difficult to meet they could hurt some smaller firms the most, since smaller firms tend to have less sophisticated research and development capabilities. This should not be a serious consideration for regulatory flexibility since the proposed standard levels on refrigerators will not be technologically difficult to meet.

Of the eight small refrigerator firms reviewed for this analysis, three make custom refrigerators, three make compact units (largely for mobile homes and recreational vehicles), and two make 3-in-1 units with range tops and sinks.

The analysis of combined-unit manufacturers is straightforward. Three-in-one units are not covered by the present standards, so these manufacturers will not be affected.

The custom refrigerator manufacturers seem to be fairly well protected for two reasons; they are not exposed to either direct foreign competition or direct competition from major domestic firms, and because they produce custom units they have a greater ability to make design changes compared to a large manufacturer. These two facts indicate that standards will probably not hurt the custom manufacturer's control of its market; however, its market may shrink due to price increases. This cannot be estimated without engineering data and an estimate of the elasticity of demand in this market. One thing must be remembered when analyzing this problem: standards will increase the price of standard refrigerators and this will offset (partly or more than completely) the impact of the price increase of custom refrigerators.

The three small manufacturers of compact refrigerators are probably at the greatest risk, both without standards and from standards. They face stiff foreign competition from large foreign manufacturers. Some anecdotal evidence indicates that part of their current competitive strategy is to use cheaper, less efficient compressors than their foreign competition. Depending on the level of standards, this option could be foreclosed, forcing them to buy compressors at a higher price than that paid by their larger competitors who either buy in volume or in some cases manufacture their own. Still, it would seem that these small manufacturers must have some advantages from the niche they occupy or they would have already succumbed to their competition. These advantages would need to be accounted for before a firm conclusion could be drawn.

Now consider the truly small firms—those that cater to very specialized niche markets. There are only about a dozen of these and they tend to be very small compared with the major firms. Because of this, they have little time to cooperate with data collection efforts and consequently relatively little is know about them. Specifically, engineering cost data is not separately available for small firms nor are demand elasticities available. Small firms are generally not members of AHAM. Consequently, most were not included in information provided by AHAM concerning the Department's analysis and, of the ones that were, only one was included. Because of this no

financial data specific to small firms are available.

The foregoing discussion suggests that only three of the eight small manufacturers on whom the effects of standards were evaluated, would possibly suffer from the proposed standards on refrigerators. The Department believes that in this industry, too, the provisions of section 605(b) are applicable, since there is no certainty that the proposed rule will "have a significant economic impact on a substantial number of small entities."

V. Public Comment Procedures

a. Participation in Rulemaking

DOE encourages the maximum level of public participation possible in this rulemaking. Individual consumers, representatives of consumer groups, manufacturers' associations, States or other governmental entities, utilities, retailers, distributors, manufacturers, and others are urged to submit written statements on the proposal. The Department also encourages interested persons to participate in the public hearing to be held in Washington, DC, at the time and place indicated at the beginning of this notice.

The DOE has established a comment period of 60 days following publication of this notice for persons to comment on this proposal.

b. Written Comment Procedures

Interested persons are invited to participate in this proceeding by submitting written data, views or arguments with respect to the subjects set forth in this notice. Instructions for submitting written comments are set forth at the beginning of this notice and below.

Comments should be labeled both on the envelope and on the documents, "Three Products Rulemaking (Docket No. CAS–RM–87–102)," and must be received by the date specified at the beginning of this notice. Ten copies are requested to be submitted. All comments received by the date specified at the beginning of this notice and other relevant information will be considered by DOE before final action is taken on the proposed regulation.

All written comments received on the proposed rule will be available for public inspection at the Freedom of Information Reading Room, as provided at the beginning of this notice.

Pursuant to the provisions of 10 CFR 1004.11, any person submitting information or data that is believed to be confidential and exempt by law from public disclosure should submit one complete copy of the document and 10 copies, if possible, from which the information believed to be confidential has been deleted. DOE will make its own determination with regard to the confidential status of the information or data and treat it according to its determination.

Factors of interest to DOE, when evaluating requests to treat information as confidential include: (1) A description of the item; (2) an indication as to whether and why such items of information have been treated by the submitting party as confidential, and whether and why such items are customarily treated as confidential within the industry; (3) whether the information is generally known or available from other sources; (4) whether the information has previously been made available to others without obligation concerning its confidentiality; (5) an explanation of the competitive injury to the submitting person that would result from public disclosure; (6) an indication as to when such information might lose its confidential character due to the passage of time; and (7) whether disclosure of the information would be in the public interest.

c. Public Hearing

1. Procedure for Submitting Requests to Speak

The time and place of the public hearing are indicated at the beginning of this notice. DOE invites any person who has an interest in these proceedings, or who is a representative of a group or class of persons having an interest, to make a written request for an opportunity to make an oral presentation at the public hearing. Such requests should be labeled both on the letter and the envelope, "Three Products Rulemaking (Docket No. CAS–RM–87–102)," and should be sent to the address, and must be received by the time specified, at the beginning of this notice. Requests may be hand-delivered or phoned in to such address between the hours of 8:30 a.m. and 4:30 p.m., Monday through Friday, except Federal holidays.

The person making the request should briefly describe the interest concerned and, if appropriate, state why he or she is a proper representative of the group or class of persons that has such an interest, and give a telephone number where he or she may be contacted. Each person selected to be heard will be so notified by DOE as to the time they will be speaking.

Each person selected to be heard is requested to submit 10 copies of the statement at the beginning of the hearing. In the event any persons wishing to testify cannot meet this requirement, that person may make alternative arrangements with the Office of Hearings and Dockets in advance by so indicating in the letter requesting to make an oral presentation.

2. Conduct of Hearing

DOE reserves the right to select the persons to be heard at the hearing, to schedule the respective presentations, and to establish the procedures governing the conduct of the hearing. The length of each presentation is limited to 20 minutes.

A DOE official will be designated to preside at the hearing. The hearing will not be a judicial or an evidentiary-type hearing, but will be conducted in accordance with 5 U.S.C. 533 and section 336 of the Act. At the conclusion of all initial oral statements at each day of the hearing, each person who has made an oral statement will be given the opportunity to make a rebuttal statement, subject to time limitations. The rebuttal statement will be given in the order in which the initial statements were made. The official conducting the hearing will accept additional comments or questions from those attending, as time permits. Any interested person may submit to the presiding official written questions to be asked of any person making a statement at the hearing. The presiding official will determine whether the question is relevant, and whether time limitations permit it to be presented for answer.

Further questioning of speakers will be permitted by DOE. The presiding official will afford any interested person an opportunity to question, with respect to disputed issues of material fact, other interested persons who have made oral presentations, as well as employees of the United States Government who have made written or oral presentations, relating to the proposed rule. This opportunity will be afforded after any rebuttal statements, to the extent that the presiding official determines that such questioning is likely to result in a more timely and effective resolution of disputed issues of material fact. If the time provided is insufficient or inconvenient, DOE will consider affording an additional opportunity for questioning at a mutually convenient time. Persons interested in making use of this opportunity must submit their request to the presiding official no later than shortly after the completion of any rebuttal statements and be prepared to state specific justification, including why the issue is one of disputed fact and how the proposed questions would expedite their resolution.

Any further procedural rules regarding proper conduct of the hearing will be announced by the presiding official.

A transcript of the hearing will be made, and the entire record of this rulemaking, including the transcript, will be retained by DOE and made available for inspection at the DOE Freedom of Information Reading Room as provided at the beginning of this notice. Any person may purchase a copy of the transcript from the transcribing reporter.

d. Issues Requested for Comment

As discussed above in today's notice, DOE has identified a number of issues where comments are requested. These issues include, but are not limited to the following:

- The refrigerator baseline units and the base case;
- Refrigerator market share elasticities;
- Rebound effect for refrigerators, television sets, small gas furnaces and all other space heating and cooling products;
- Refrigerator usage elasticities;
- Appropriate discount rates, including those for consumer analyses (LCC and LBL–REM) and the use of a social discount rate (LBL–REM);
- Energy price forecasts;
- The characterization of prototypical firms for the manufacturer impact analysis (LBL–MIM);
- Impacts of the EPA restriction on CFC manufacture; and
- Refrigerator efficiency forecasts.

In consideration of the foregoing, it is proposed to amend Part 430 of Chapter II of Title 10, Code of Federal Regulations, as set forth below.

Issued in Washington, DC, November 22, 1988.

John R. Berg,

Assistant Secretary, Conservation and Renewable Energy.

List of Subjects in 10 CFR Part 430

Administrative practice and procedure, Energy conservation, Household appliances.

PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

1. The authority citation for Part 430 continues to read as follows:

Authority: Energy Policy and Conservation Act, Title III, Part B, as amended by National Energy Conservation Policy Act, Title IV, Part 2, National Appliance Energy Conservation Act of 1987, and National Appliance Energy Conservation Amendments of 1988 (42 U.S.C. 6291–6309).

2. Subpart C of Part 430 is revised to read as follows:

Subpart C—Energy Conservation Standards

Sec.
430.31 Purpose and scope.
430.32 Energy Conservation Standards.

Subpart C—Energy Conservation Standards

§ 430.31 Purpose and scope.

This subpart contains any energy conservation standards for classes of covered products that are required to be administered by the Department of Energy pursuant to the energy conservation program for consumer products other than automobiles under the Energy Policy and Conservation Act, as amended (42 U.S.C. 6291 *et seq.*).

§ 430.32 Energy conservation standards.

The energy conservation standards for the covered product classes are:

(a) Refrigerators/refrigerator-freezers/freezers.

Product class	Energy standards equations January 1, 1993 [2]
1. Refrigerators and refrigerator-freezers with manual defrost	(16.3AV + 316) to (11.9AV + 258).
2. Refrigerator-freezers-partial automatic defrost	(21.8AV + 429) to (14.1AV + 305).
3. Refrigerator-freezers-automatic defrost with top-mounted freezer without ice [1]	(23.5AV + 471) to (16.8AV + 363).
4. Refrigerator-freezers-automatic defrost with side-mounted freezer without ice	(27.7AV + 488) to (13.1AV + 540).
5. Refrigerator-freezers-automatic defrost with bottom-mounted without ice	(27.7AV + 488) to (17.9AV + 386).
6. Refrigerator-freezers-automatic defrost with top-mounted freezer with through the door ice service	(26.4AV + 535) to (17.6AV + 380).
7. Refrigerator-freezers-automatic defrost with side-mounted freezer with through the door ice	(30.9AV + 547) to (15.2AV + 625).
8. Upright freezers with manual defrost	(10.9AV + 422) to (12.3AV + 181).
9. Upright freezers with automatic defrost	(16.0AV + 623) to (18.0AV + 264).
10. Chest freezers and all other freezers	(14.8AV + 223) to (11.2AV + 163).

[1] Including all refrigerators with automatic defrost.
[2] The Energy Standards Equations selected will be from these ranges.
AV = Total adjusted volume, expressed in Ft [3].

(b)–(d) [Reserved]

(e) Furnaces.

Product class	Annual fuel utilization efficiency (percent)	Effective date
1.–2. [Reserved]		
3. Small furnaces (input rate less than 45,000 Btu/hours:		
(A) Weatherized (outdoor)	78	January 1, 1992.
(B) Non-weatherized (indoor)	78	January 1, 1992.

(f)–(k) [Reserved]

(l) Television Sets.

No standard.

[FR Doc. 88–27595 Filed 12–1–88; 8:45 am]

BILLING CODE 6450–01–M

DEPARTMENT OF ENERGY

Office of Conservation and Renewable Energy

Energy Conservation Program for Consumer Products; Finding of No Significant Impact

AGENCY: Department of Energy.

ACTION: Finding of No Significant Impact (FONSI) on proposed rulemaking for energy conservation standards for 3 types of consumer products.

SUMMARY: The Energy Policy and Conservation Act (EPCA), as amended by the National Energy Conservation Policy Act (NECPA) and the National Appliance Energy Conservation Act (NAECA), prescribes energy conservation standards for certain major household appliances, and requires the Department of Energy (DOE) to administer an energy conservation program for these products. As a general matter, these Federal standards preempt State and local standards and any other State and local requirements with respect to energy efficiency or energy use of these products. Among other things, NAECA requires DOE to consider amending the energy conservation standards for refrigerators, refrigerator-freezers, and freezers; to establish standards for small gas furnaces; and to consider establishing energy conservation standards for television sets.

In accordance with NAECA, the Department has reviewed possible standards for refrigerators, refrigerator-freezers and freezers, small gas furnaces and television sets as discussed in today's notice of proposed rulemaking.

For refrigerators, refrigerator-freezers and freezers, the Department is proposing a range of standards that includes not increasing the stringency of the standard level. DOE is soliciting comments and information from the public to be considered in promulgating the final rule. As discussed in the proposed rule, the final rule will specify a specific level for refrigerators, refrigerator-freezers and freezers.

For small gas furnaces, the Department is proposing to determine that standards would result in a significant conservation of energy and be economically justified. Therefore, the Department is today proposing to amend 10 CFR Part 430 to add standards for this product.

Finally, for television sets, the Department is proposing to determine that an energy conservation standard would result in a significant conservation of energy but would not be economically justified. Therefore, the Department is proposing to amend Part 430 to include a determination of no standard for television sets.

Based on an Environmental Assessment (EA), DOE has determined that none of the proposed standards, including the "no standard" for television sets, are a major federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA). Therefore an Environmental Impact Statement will not be prepared. The EA is part of the Technical Support Document for the proposed standards and is available on request at the following address.

Public Availability

Hearings and Dockets Branch, Office of Conservation and Renewable Energy, U.S. Department of Energy, Docket Number CE–RM–87–102, 1000 Independence Avenue SW., Room 6B–025, Washington, DC 20585: (202) 586–9320.

FOR FURTHER INFORMATION CONTACT:

Michael J. McCabe, U.S. Department of Energy, Office of Conservation and Renewable Energy, Forrestal Building, Mail Station CE–132, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586–9127.

Donald E. Henninger, U.S. Department of Energy, Office of NEPA Project Assistance, Forrestal Building, Mail Station EH–25, 1000 Independence Avenue SW., Washington, DC 20585, (202) 586–4600.

Martha S. Crosland, U.S. Department of Energy, Office of General Counsel, Forrestal Building, Mail Station GC–11, 1000 Independence Avenue SW., Washington, DC 20585, (202) 586–6947.

SUPPLEMENTARY INFORMATION: DOE prepared an Environmental Assessment (EA) on the proposed standards pursuant to the National Environmental Policy Act of 1969, as amended, Pub. L. 91–190, 40 U.S.C. 4221 *et seq.*, and the implementing regulations of the Council on Environmental Quality (40 CFR Parts 1500 through 1808). The EA addresses the possible incremental environmental effects attributable to the application of the proposed standards to the design of refrigerators, refrigerator-freezers, and freezers; and small gas furnaces. The EA also looked at the impact of energy conservation standards for television sets. As discussed in the General Findings, the "no standard" standard for televisions will not change the status quo and therefore will not result in any environmental impact. The effect of the proposed standards range from no change to a slight improvement in the outdoor environment as discussed in the General Findings below.

Approach Used in the Analysis

This assessment evaluates the environmental impacts resulting from the proposed setting of new or amended energy-efficiency standards for refrigerators, refrigerator-freezers, freezers, and small gas furnaces and the proposed setting of no standards for television sets in accordance with the NAECA. A complete description of the Engineering and Economic Analysis of the proposed standards may be found in the Technical Support Document (TSD).

The two main environmental concerns addressed are emissions from fossil fuel fired electricity generation and the chlorofluorocarbons used in the production of rigid insulation foam.

Four of the fourteen scenarios for product design changes described in the Engineering Analysis of the TSD were chosen for study based on their relative importance as design measures. Values for energy savings that result from product design changes are also taken from the TSD.

An in-depth analysis of particulate emissions is not included in this assessment because particulate emissions are relatively small compared to sulfur and nitrogen oxide emissions. Current electricity generating methods are far cleaner than those of the past. In 1984, power plants contributed only 7 percent of U.S. total particulate emissions as compared to contributions of 83 percent and 34 percent to total SO_2 and NO_2 emissions, respectively (EPA, 1986).

General Findings

1. Refrigerators, Refrigerator-Freezers and Freezers

The proposed standards for refrigerators, refrigerator-freezers, and freezers range from retaining the federally mandated standards contained in NAECA, up to three more stringent standards. The greatest impacts of the proposed standards, other than the minimum NAECA standards, are the result of generating less electricity. Power plants' main environmental effects on air and water result from emissions of sulfur oxides (SO_x), nitrogen oxides (NO_x), and carbon dioxide (CO_2). All SO_x and NO_x emissions are expressed in the equivalent weights of SO_2 and NO_2, respectively. Carbon dioxide emissions are commonly expressed as tons of carbon. Additionally, there would be some shifting of CFC use. General findings are summarized below:

A. Sulfur Dioxide

The greatest decrease in air pollution will occur for sulfur dioxide. The possible reductions range from no change up to 151,000 tons or 0.9 percent of the U.S. SO_2 emissions expected to be emitted by power plants by the year 2010 for the most stringent standard proposed.[1]

B. Nitrogen Dioxide

The possible reductions in NO_2 range from no change up to 100,000 tons or 1.0 percent of the total NO_2 emissions expected to be emitted by power plants by the year 2010 for the most stringent standard proposed.[2]

C. Carbon Dioxide

The possible reductions in CO_2 range from no change up to the equivalent of 9,180,000 tons or 0.2 percent of the worldwide CO_2 emissions for the year 2010 for the most stringent standard proposed.[3]

D. Chlorofluorocarbons

An additional effect of some design change scenarios is an increased consumption of CFC's. CFC–11 is contained in the rigid foam insulation used in the appliances and CFC–12 is the heat exchange fluid used in refrigerators and freezers. The possible increased use ranges from no change to one percent of the 1985 total United States CFC–11 and CFC–12 consumption for the most stringent standards proposed. However, since CFC production has been limited, any extra consumption would have to come from other uses and would not result in a net increase in CFC production.

None of the environmental impacts from the savings of SO_2, NO_2, or CO_2 from the range of proposed standards are considered to be significant.

2. Small Gas Furnaces

The greatest impact of the proposed standard for small gas furnaces is a decrease in electricity consumption as some households shift from electric heating to small gas furnaces and decreases in gas and oil burned in homes. General findings are summarized below:

A. Sulfur Dioxide

The reduction in SO_2 would be 6800 tons or 4.2 percent of the emissions estimated to come from residential fuel combustion during 2010.

B. Nitrogen Dioxide

The reduction in NO_2 would be 5100 tons or 1.3 percent of the emissions estimated to come from residential fuel combustion during 2010.

C. Carbon Dioxide

The reduction in CO_2 would be equivalent to 569,000 tons of carbon or .01 percent of the worldwide CO_2 emissions for the year 2010.

None of the environmental impacts from the savings of SO_2, NO_2, or CO_2 from the proposed standard are considered to be significant.

3. Television Sets

The proposed "no standard" standard for television sets results in no impact on the environment since it will not change the status quo. DOE is unaware of any State or local energy conservation standards concerning television sets that would be preempted by the "no standard" standard. The only state standard for television sets of which DOE is aware is the New York State standard that bans the "instant-on" feature of tube type televisions. However, since tube type television sets are no longer manufactured, such standards currently have no effect.

Determination

Based upon the EA, DOE has determined that the proposed interim standards do not constitute a major federal action significantly affecting the quality of the human environment, within the meaning of NEPA. Therefore, an Environmental Impact Statement is not required.

Issued in Washington, DC, November 7, 1988.

Ernest C. Baynard III,

Assistant Secretary, Environment, Safety and Health.

[FR Doc. 88–27596 Filed 12–1–88; 8:45 am]

BILLING CODE 6450–01–M

[1] The upper levels are interpolated from data in Table 5.8 of the Technical Support Document for energy savings and Tables 1, 2, 5, and 6 of the Environmental Assessment for pollutant reductions. The interpolation is made between standard level 1 (engineering level 3) and standard level 4 (engineering level 8).

[2] Ibid.

[3] Ibid.